3 COUPLER

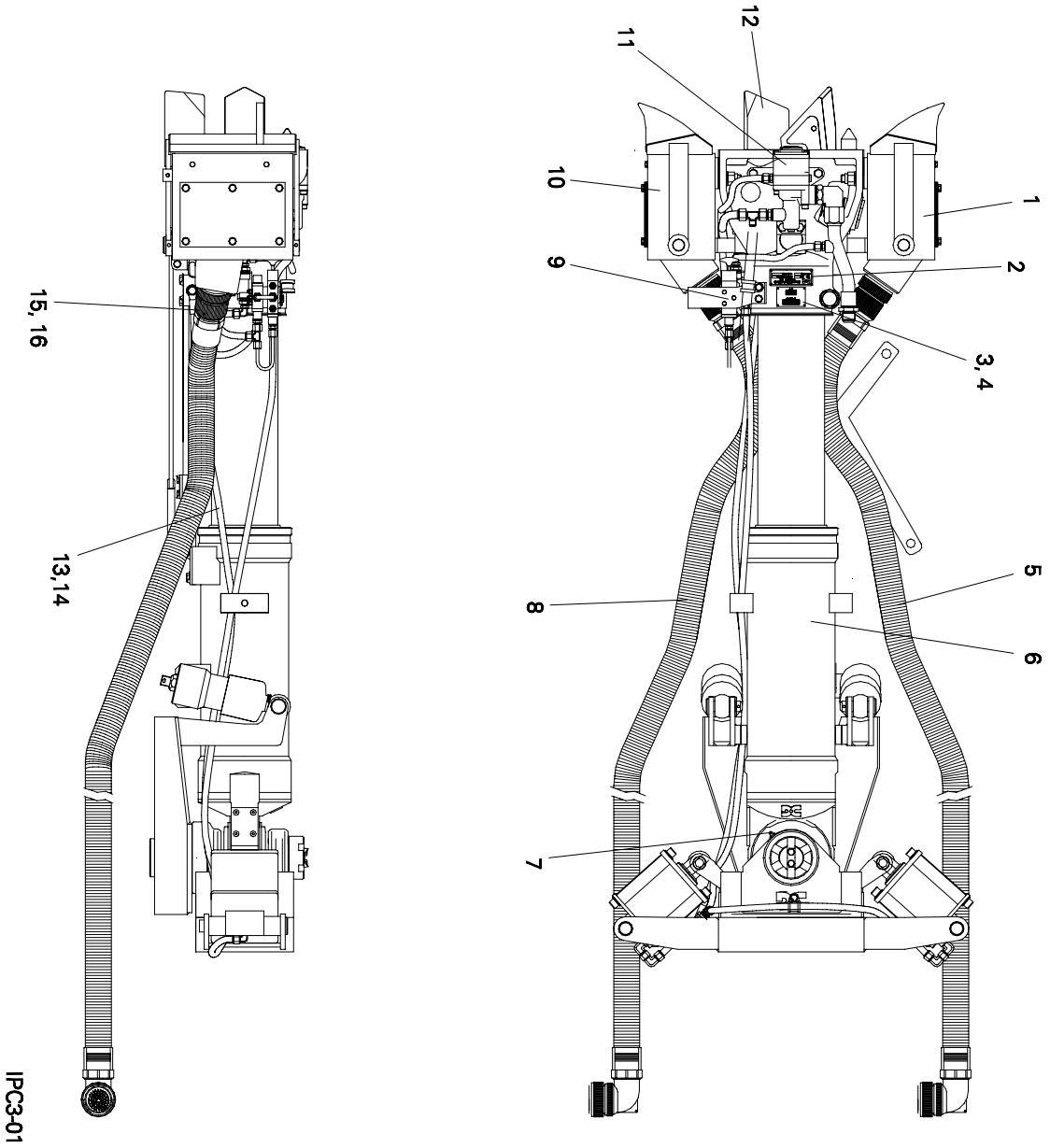


Figure 3-A. Automatic coupler

Section Figure Item	P/N	SCF Mgmt Code	MFR Code	Description	MBAT Code	U/M	Q.ty
03-A-	169157			AUTOMATIC COUPLER			1
01	170460			.ELECTRIC COUPLER, RIGHT			1
02	170810			TYPE PLATE			1
03	175652			BAR CODE SIGN			1
04	5267002005			.RIVET			8
05	169982			.CABLE ASSY, RIGHT			1
06	169999			.MECHANICAL COUPLER			1
07	5685018000			GREASE FITTING			2
08	169981			.CABLE ASSY, LEFT			1
09	170823			.PNEUMATIC SYSTEM			1
10	169956			.ELECTRIC COUPLER, LEFT			1
11	169949			.PNEUMATIC COUPLER			1
12	170455			.GUIDE HORN			1
13	170987			GROUND CABLE			1
14	176184			PROTECTIVE SPIRAL, Nylon, Ø6,4 L=1800			1
15	5477100000			WASHER, BRB 10,5x22x2 -S.st - ATT.PT			2
16	5010010016			SCREW, MC6S 16x50 - S.st			2

Table 3-A. Automatic Coupler

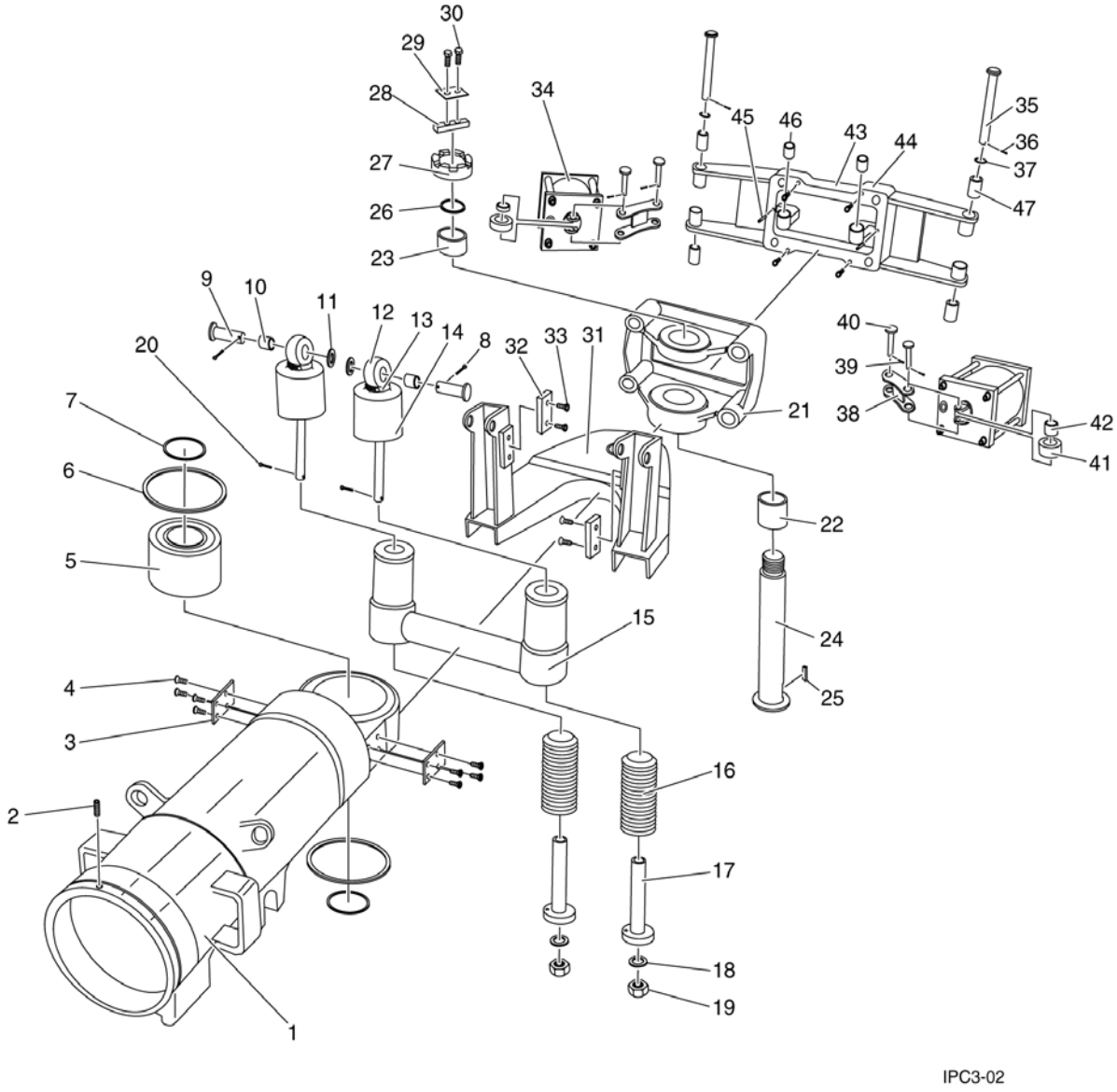


Figure 3-B. Mechanical Coupler, Part 1

Section Figure Item	P/N	SCF Mgmt Code	MFR Code	Description	MBAT Code	U/M	Q.ty
03-B	169999			MECHANICAL COUPLER SEE FIGURE 3-1 FOR NHA			REF
01	169990			.BUFFER TUBE			1
02	5136008012			.STOP SCREW, T6SS 8x12			2
03	176166			..WEAR PLATE, S.st			2
04	5103006016			..SCREW, MF6S M6X16 - S.st - ATT.PT			8
05	167089			..SPHERICAL RUBBER BEARING			1
06	5651130000			..RETAINING RING, SGA 130 - ATT.PT			2
07	167573			..THRUST WASHER			2
08	169993			.SUPPORT SPRING			1
08	5582050036			.SPLIT PIN, SP 5x36 - S.st - ATT.PT			2
09	5577220070			.CYLINDER PIN, CBH 22x70 - S.st - ATT.PT			2
10	152847			.PLAIN BEARING			2
11	5477230000			.WASHER, BRB 23x40x3 - S.st - ATT.PT			2
12	170477			..DRAFT BAR			2
13	152651			..STRIP			2
14	164693			..PROTECTIVE HOUSING			2
15	170008			..SPRING CASING			1
16	5545603025			..DISK SPRING, 60x30,5x2,5 - NICKEL PL			70
17	170011			..GUIDE SLEEVE			2
18	5653065000			..CLAMP RING, SGH 65 FZB - ATT.PT			2
19	5369020000			..NUT, FS M20 .8 - S.st - ATT.PT			2
20	5581050030			..SPLIT PIN, SP 5x30 SM66 - S.st - ATT.PT			2
21	169983			.BEARING BRACKET			1
22	170817			.BEARING			1
23	170816			.BEARING			1
24	170647			..PIN			1
				(CONTINUED)			
25	5621018050			..KEY, SMS 2306-18x11-50 - ATT.PT			1
26	167258			..WASHER			1
27	170646			..NUT - ATT.PT			1
28	170676			..KEY - ATT.PT			1

Section Figure Item	P/N	SCF Mgmt Code	MFR Code	Description	MBAT Code	U/M	Q.ty
29	170815			..SECURING PLATE - ATT.PT			1
30	5010008025			..SCREW, M6 8x25 - S.st - ATT.PT			2
31	170476			.SUPPORT PLATE			1
32	170800			..BEARING			2
33	5103008020			..SCREW, MF6S 8x20 - S.st - ATT.PT			4
34	169977			.CENTERING CYLINDER			2
35	170674			.PIN - ATT.PT			2
36	5582050036			.SPLIT PIN, SP 5x36 - S.st - ATT.PT			2
37	5477250000			.WASHER, BRB 25x45x4 - S.st - ATT.PT			2
38	170673			..LINK			2
39	5582050036			..SPLIT PIN, SP 5x36 - S.st - ATT.PT			4
40	5577180060			.. CYLINDER PIN, CBH 18x60 - S.st - ATT.PT			4
41	170802			..ROLLER			2
42	172974			..BEARING, Y18/20-20			2
43	170002			.CENTERING SUSPENSION			1
44	5056010070			.SCREW, MC6S 10x70 - S.st - ATT.PT			4
45	5551101020			.SLOTTED PIN, FRP Y10 L=20 - S.st - ATT.PT			2
46	172973			.BEARING, Y18/20-15			4
47	172976			.BEARING, Y25/28-40			4

Table 3-B. Mechanical Coupler, Part 1

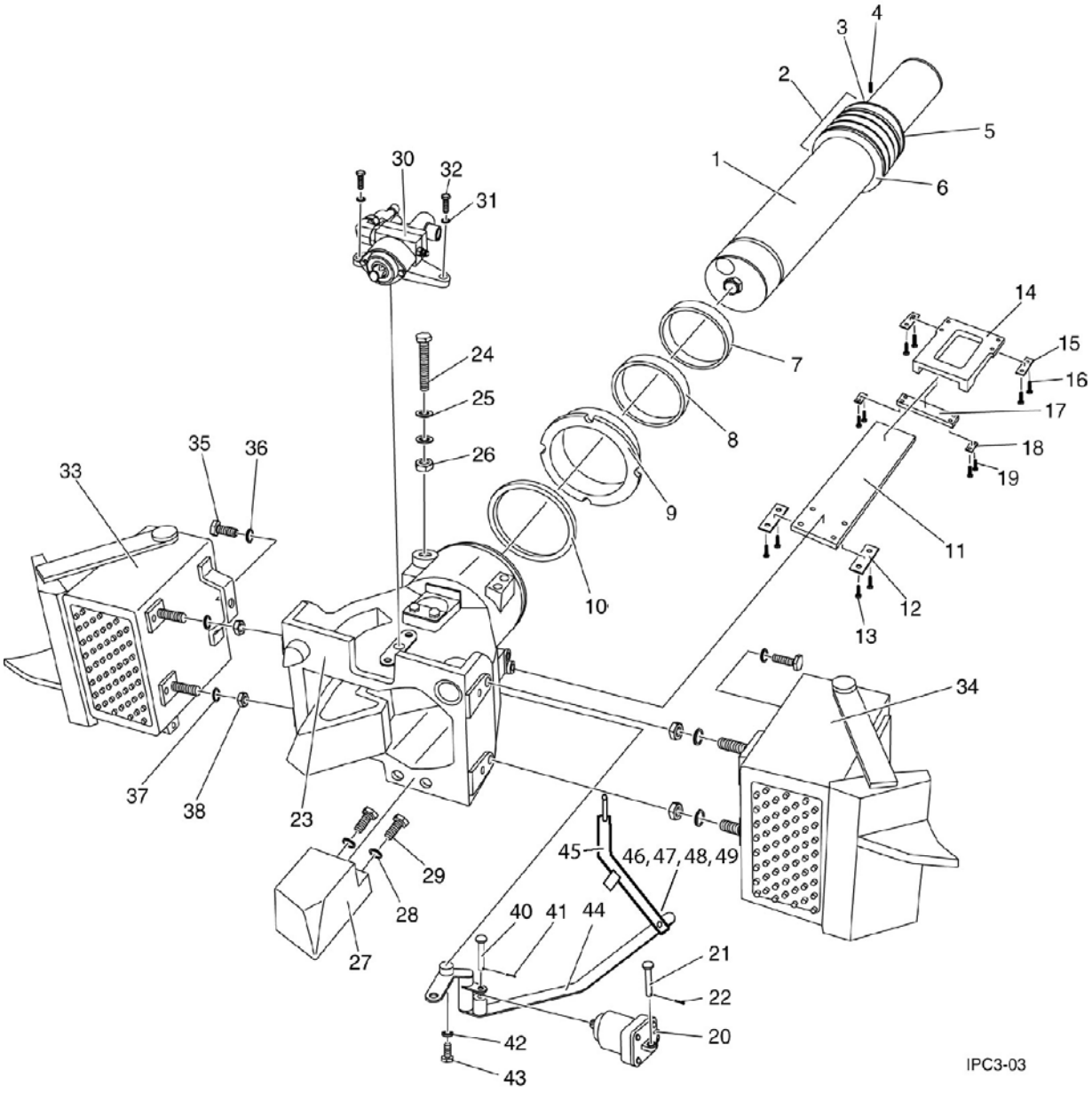


Figure 3-C. Mechanical Coupler, Part 2

Section Figure Item	P/N	SCF Mgmt Code	MFR Code	Description	MBAT Code	U/M	Q.ty
03-C	169999			MECHANICAL COUPLER SEE FIGURE 3-1 FOR NHA			REF
01	169942			.HYDRAULIC BUFFER			1
02	164162			..RING SPRING, 400kN - TYPE 1356			1
03	169094			..NUT - ATT.PT			1
04	5136008012			..STOP SCREW, T6SS 8x12 - ATT.PT			2
05	169092			..RING - ATT.PT			1
06	169091			..RING - ATT.PT			1
07	169093			..BEARING			1
08	171387			..BEARING			1
09	171386			..NUT - ATT.PT			1
10	153992			..STRIPPER, NBR - 140x155x16/10			1
11	170675			.GUIDE RAIL			1
12	170812			.SECURING PLATE - ATT.PT			2
13	5010010035			.SCREW, M6S 10x35 - S.st - ATT.PT			4
14	170648			..GUIDE BAR			1
15	170813			..SECURING PLATE - ATT.PT			2
16	5010010025			..SCREW, M6S 10x25 - S.st - ATT.PT			4
17	175646			…COVER			1
18	170811			…SECURING PLATE - ATT.PT			2
19	5010008020			…SCREW, M6S 8x20 - S.st - ATT.PT			4
20	169978			.UNCOUPLING CYLINDER			1
21	5577160040			.CYLINDER BOLT, CBH 16x40 - S.st - ATT.PT			1
22	5582040032			.SPLIT PIN, Y 4x32, S.st - ATT.PT			1
23	170005			.MECHANICAL COUPLER HEAD			1
24	5010020160			.SCREW, M6S 20x160 - S.st - ATT.PT			1
				(CONTINUED)			

Section Figure Item	P/N	SCF Mgmt Code	MFR Code	Description	MBAT Code	U/M	Q.ty
25	5477210000			.WASHER, BRB 21x36x3 - S.st - ATT.PT			2
26	5353020000			.NUT, M20 - S.st - ATT.PT			1
27	170455			.GUIDE HORN			1
28	5492162000			.WASHER, FHB 16.2, FZB - S.st - ATT.PT			2
29	5056016050			.SCREW, MC6S 16x50 - S.st - ATT.PT			2
30	169949			.PNEUMATIC COUPLER			1
31	5492102000			.WASHER, FBH 10.2 - S.st - ATT.PT			2
32	5010010035			.SCREW, M6S 10x35 - S.st - ATT.PT			2
33	170460			.ELECTRIC COUPLER, RIGHT			1
34	169956			.ELECTRIC COUPLER, LEFT			1
35	5010016030			.SCREW, M6S 16x30 - S.st - ATT.PT			1
36	5492170000			.WASHER, FBH 17x30x3 - S.st - ATT.PT			1
37	5353016000			.NUT, M16 - S.st - ATT.PT			2
38	5492170000			.WASHER, FBH 17x30x3 - S.st - ATT.PT			2
40	5577160070			.CYLINDER BOLT, CBH 16x70 - S.st - ATT.PT			1
41	5582040032			.SPLIT PIN, Y 4x32 - S.st - ATT.PT			1
42	5477130000			.WASHER, BRB 13x24x2.5 - S.st - ATT.PT			1
43	5010012040			.SCREW, M6S 12x40 - S.st - ATT.PT			1
44	185716			UNCOUPLING ARM			1
45	185718			FOLD ARM			1
46	5357008000			NUT 5/16", A4- S.st - ATT.PT			1
47	5036008038			SCREW U6S 5/16" A4 UNC x38 - S.st - ATT.PT			1
48	5477084000			WASHER, RB 8.4x16x1.5 - S.st - ATT.PT			2
49	186482			BUSHING			1

Table 3-C. Mechanical Coupler, Part 2

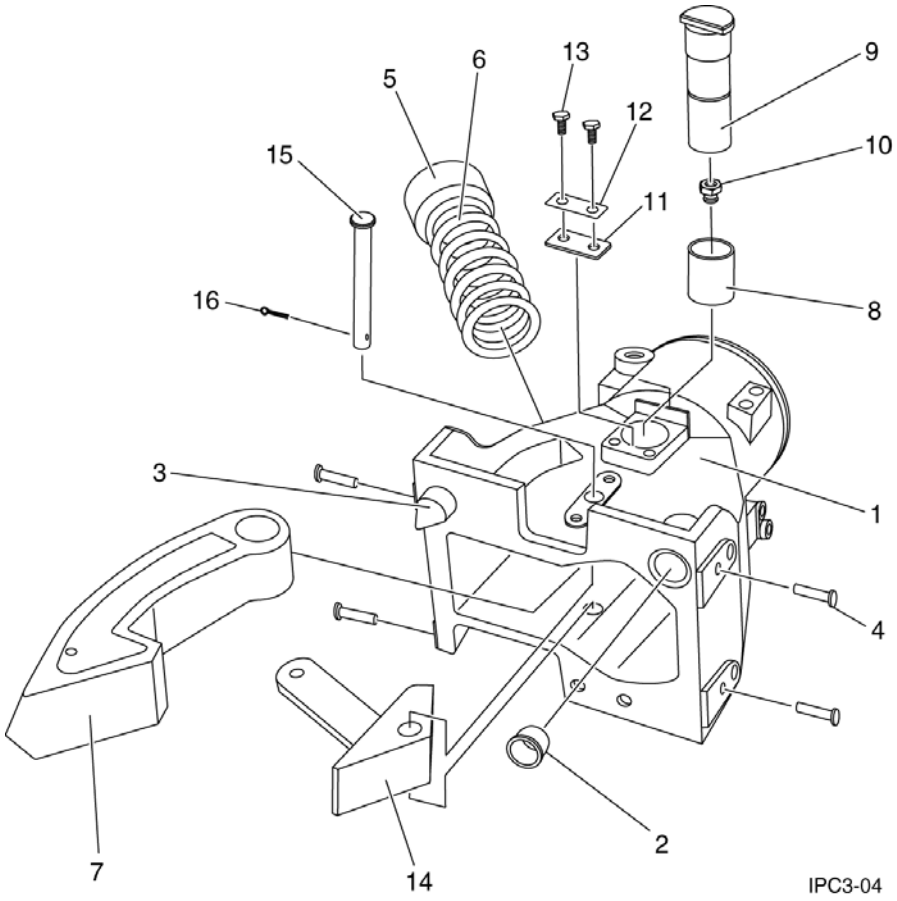


Figure 3-D. Mechanical Coupler Head

Section Figure Item	P/N	SCF Mgmt Code	MFR Code	Description	MBAT Code	U/M	Q.ty
03-D	170005			MECHANICAL COUPLER HEAD, SEE FIGURE 3- 1 FOR NHA.			REF
01	169947			.COUPLER HEAD HOUSING			1
02	169996			.GUIDE BUSHING			1
03	169995			.GUIDE PIN			1
04	5565951016			.CYLINDER PIN, Y3/8"x5/8" - S.st			4
05	169994			..SPRING SUPPORT			1
06	169998			..COIL SPRING			1
07	169943			..HOOK			1
08	163888			..BEARING, GLY.PG 404430 A			2
09	170006			..MAIN PIN			1
10	5689018000			..GREASE FITTING, CH KR 1/8"			1
11	155850			...SECURING PLATE			1
12	170007			…SECURING WASHER, ATT.PT			1
13	5010010020			…SCREW, M6S 10x20 - S.st - ATT.PT			2
14	169940			..UNCOUPLING CAM			1
15	170004			..UNOUPLING SHAFT, ATT.PT			1
16	5582050032			..SPLIT PIN, Y5x32 - S.st - ATT.PT			1

Table 3-D. Mechanical Coupler Head

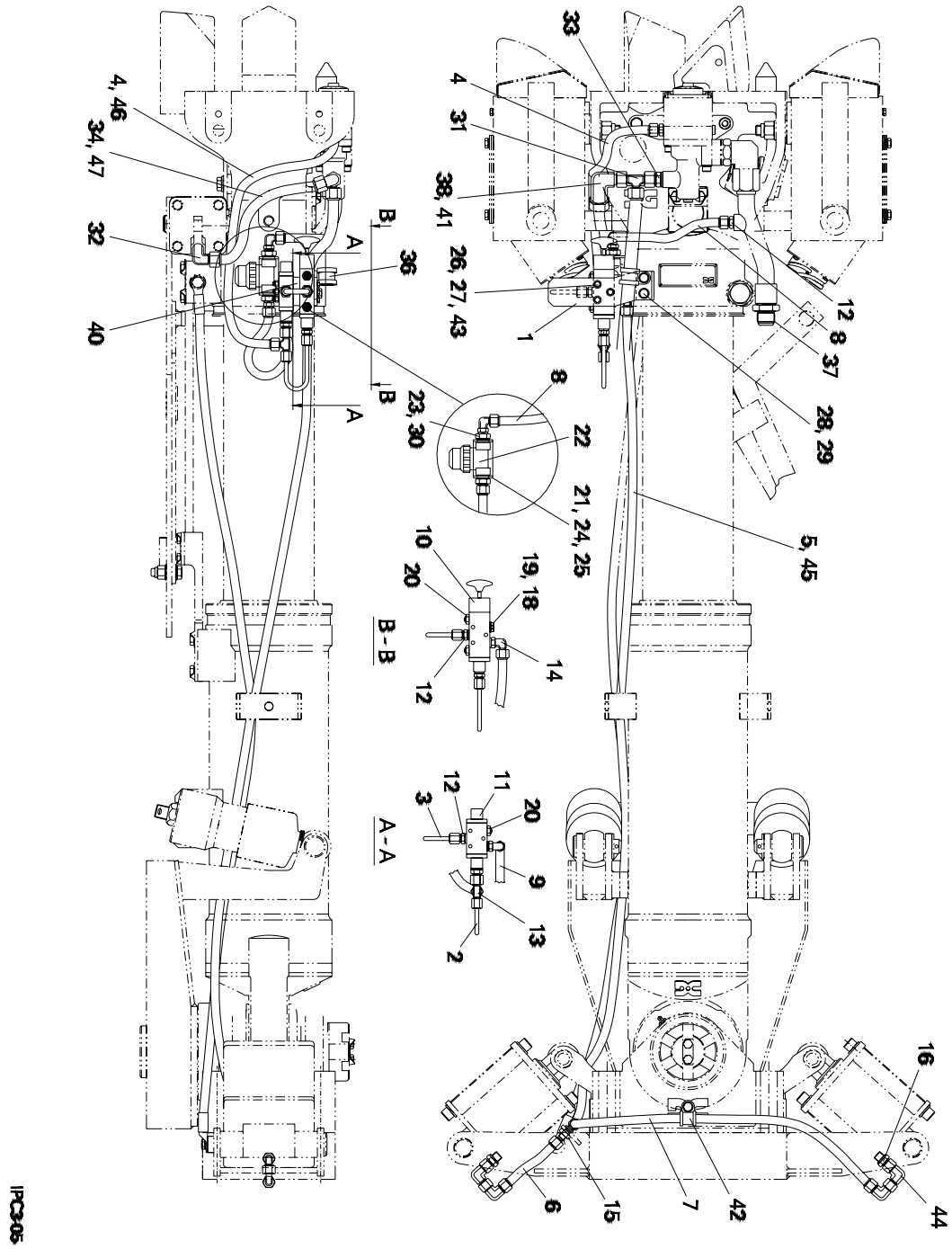


Figure 3-E. Pneumatic System

Section Figure Item	P/N	SCF Mgmt Code	MFR Code	Description	MBAT Code	U/M	Q.ty
03-E	170823			PNEUMATIC SYSTEM			1
01	170827			PLATE			1
02	170828			TUBE			1
03	170829			TUBE			1
04	170830			HOSE, L=600			1
05	170981			HOSE, L=1450			1
06	170982			HOSE, L=120			1
07	170983			HOSE, L=560			1
08	170984			HOSE, L=210			1
09	170985			HOSE, L=260			1
10	170809			VALE, 5/2			1
11	170808			VALE, 3/2			1
12	151356			ADAPTOR, F40XS6-1/8			6
13	172972			ADAPTOR, R6XS6			1
14	151357			ADAPTOR, C40XS6-1/8			3
15	179928			ADAPTOR, WJTX-WLNS4			1
16	581110603X			ADAPTOR, F40XS6-1/8			2
17							
18	167623			CHOKE, St. /Fzb, G 1/8"			1
19	5703012000			WASHER, St. /Fzb/rub, TT No12			1
20	5865050018			SILENSER, G 1/8"			3
21	170847			FILTER ATTACHEMENT			1
22	165701			FILTER, 3/8"			1
23	151869			WASHER, 3/8"			4
24	5477064000			WASHER, S.St, BRB 6.4			2
25	5010006012			SCREW, S.St, M6S 6x12			2
26	5010005070			SCREW			3
27	5353005000			LOCK NUT, S.St, M5			3
28	5010008020			SCREW, S.St M6S 8x20			3
29	5477084000			WASHER, S.St BRB 8.4			3
30	151366			ADAPTOR, REDUCER 3/8" –1/8"			2
31	172970			ASAPTOR, R6XS10			1
32	172969			ADAPTOR, CTXS10-3/8			1
33	167521			ADAPTOR, F40XS10-3/8			1
34	171396			HOSE, L=200			1
35							
36	179924			CABLE CLAMP, RSGU 1.20/20			1

Section Figure Item	P/N	SCF Mgmt Code	MFR Code	Description	MBAT Code	U/M	Q.ty
37	173531			ADAPTOR, F40XS18-3/4			1
38	179923			REDUCING, TRTXS15-10			1
39							
40	176115			PLATE			1
41	168217			ADAPTOR, C6X10			1
42	157413			CLAMP, RSGU 1.11/20			1
43	5477053000			WASHER, S.St, BRB 5.3			6
44	581730611X			ADAPTOR, C6XS6			4
45	176184-1800			PROTECTIVE SPIRAL, Nylon, Ø6.4 L=1800			1
46	176184-1100			PROTECTIVE SPIRAL, Nylon, Ø6.4 L=1100			1
47	176184-400			PROTECTIVE SPIRAL, Nylon, Ø6.4 L=400			1

Table 3-E. Pneumatic System

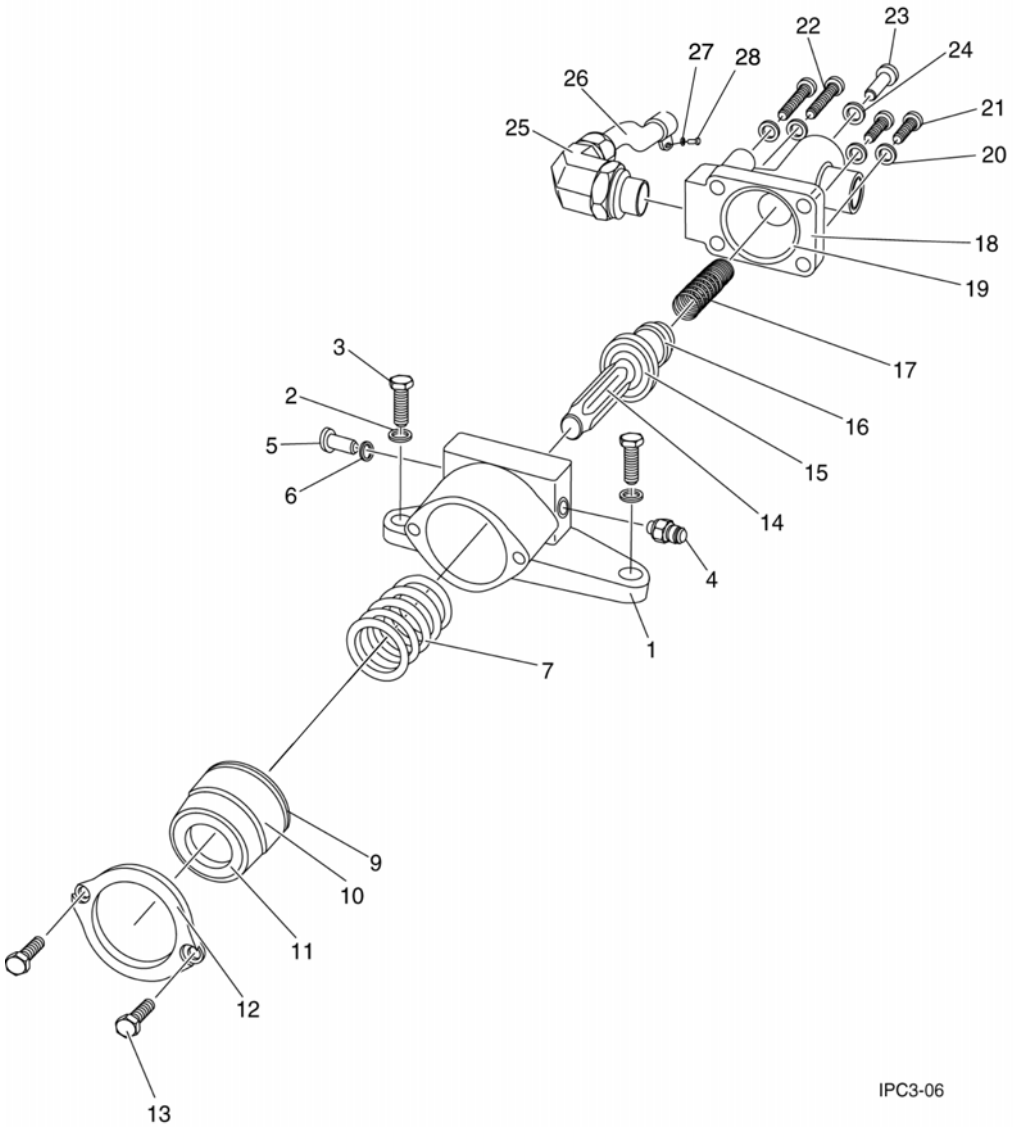


Figure 3-F. Pneumatic Coupler

Section Figure Item	P/N	SCF Mgmt Code	MFR Code	Description	MBAT Code	U/M	Q.ty
03-F	169949			PNEUMATIC COUPLER, SEE FIGURE 3-3 FOR NHA			REF
01	170461			.VALVE BRACKET, BRASS			1
02	5492102000			.WASHER, FBH 10.2 - S.st - ATT.PT			2
03	5010010035			.SCREW, M6S 10x35 - S.st - ATT.PT			2
04	5844180716			.ADAPTOR			1
05	5961018000			.HEXAGON PLUG, DIN 908 G 1/8" - St./Fzb			1
06	5703012000			.TREDO WASHER, TT No 12 - St./Fzb/rub.			1
07	170473			.SPRING, S.st			1
08							
09	5725442030			.O-RING, 44.2x3 - NBR			1
10	170459			.SEAL HOLDER, BRASS			1
11	184173			.SEAL			1
12	170458			.SECURING WASHER, S.st			1
13	5056006020			.SCREW, MC6S 6x20 - S,st - ATT.PT			2
14	170457			.VALVE ROD, BRASS			1
15	153338			.SEAL			1
16	5725173024			.O-RING, 17.3x2.4 - NBR			1
17	5875201668			.SPRING, S.st			1
18	167577			.VALVE HOUSING, BRASS			1
19	5725473017			.O-RING, 47.3x1.78 - NBR			1
20	5492082000			.WASHER, FHB 8.2 - S.st - ATT.PT			4
21	5056008020			.SCREW, MC6S 8x20 - S.st - ATT.PT			2
22	5056008050			.SCREW, MC6S 8x50 - S.st - ATT.PT			2
23	167623			.CHOKE, G 1/8" - St./Fzb			1
24	5703012000			.TREDO WASHER, TT No 12 - St./Fzb/rub.			1
25	169422			.ADAPTOR 90°, G ¾" - St./Fzb.			1
26	170654			.TUBE, COMPLETE			1
27	5459080018			.WASHER St./Fzb, 9x18 SRB. FZB			1
28	5010008012			S.St M6S 8x12			1

Table 3-F. Pneumatic Coupler

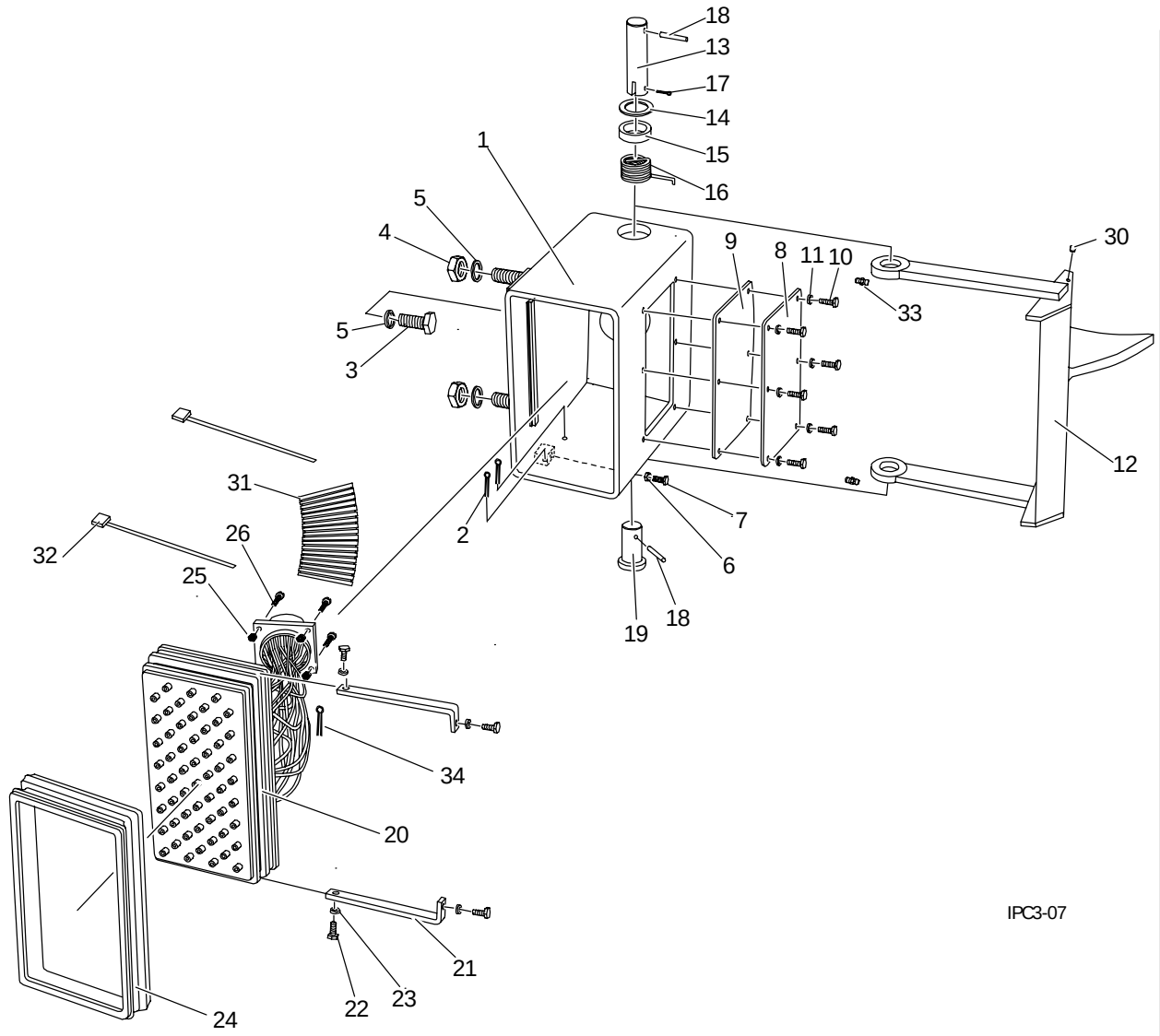


Figure 3-G. Electrical Coupler, Left

Section Figure Item	P/N	SCF Mgmt Code	MFR Code	Description	MBAT Code	U/M	Q.ty
03-G	169956			ELECTRICAL COUPLER, LEFT, SEE FIGURE 3-3 FOR NHA			REF
01	169952			.CONTACT HOUSING			1
02	5582063036			.SPLIT PIN, 6.3x36 - S.st			1
03	5010016030			.SCREW, M6S 16x30 - S.st - ATT.PT			1
04	5353016000			.NUT, M16 - S.st - ATT.PT			2
05	5492170000			.WASHER, FBH 17x30x3 - S.st - ATT.PT			3
06	5305008000			.NUT, M6M - 8 - S.st -ATT.PT			1
07	5010008030			.SCREW, M6S 8x30 - S.st - ATT.PT			1
08	169958			..SIDE COVER			1
09	169959			..SIDE SEAL			1
10	5010008016			..SCREW, M6S 8x16 - S.st - ATT.PT			6
11	5492082000			..WASHER, FBH 8.2x16x1.5 - S.st - ATT.PT			6
12	169979			..COVER			1
13	169973			..PIN - ATT.PT			1
14	5762253510			..OIL SEAL NBR 70° d = 25/35x7x10			1
15	170463			..BEARING, GLYCODUR A d = 1" x ¾"			1
16	169970			..SPRING			1
17	5582063036			..SPLIT PIN, 6.3x6.3 - S.st - ATT.PT			1
18	5551061044			..ROLL PIN, d = ¼"x 1 ¾" - S.st - ATT.PT			2
19	169974			..PIN - ATT.PT			1
20	170462			..CONTACT DEVICE			2
21	173293			...LOCKING PLATE			4
22	5010006012			…SCREW, M6S 6x12 - S.st - ATT.PT			4
23	5701106000			...WASHER, TM 106 - St./NBR - ATT.PT			4
24	169961			..FRONT SEAL			1
25	5353004000			..NUT, M4 - S.st - ATT.PT			4
26	5212004020			..SCREW, MCS 4x20 - S.st -ATT.PT			4
27	170806			TYPE PLATE			1
28	175653			BAR CODE PLATE			1
29	5267002005			RIVET			8
30	179974			PLUG 5mm, Black, Nylon-66			1
31	1013693			PROTECTING HOSE			1
32	5895760338			CABLE STRAP TY 27 MX			2
33	5685006001			GREASE FITTING M6 S.St			2
34	5582050032			SPLIT PIN 5x32 S.St			1

Table 3-G. Electric Coupler

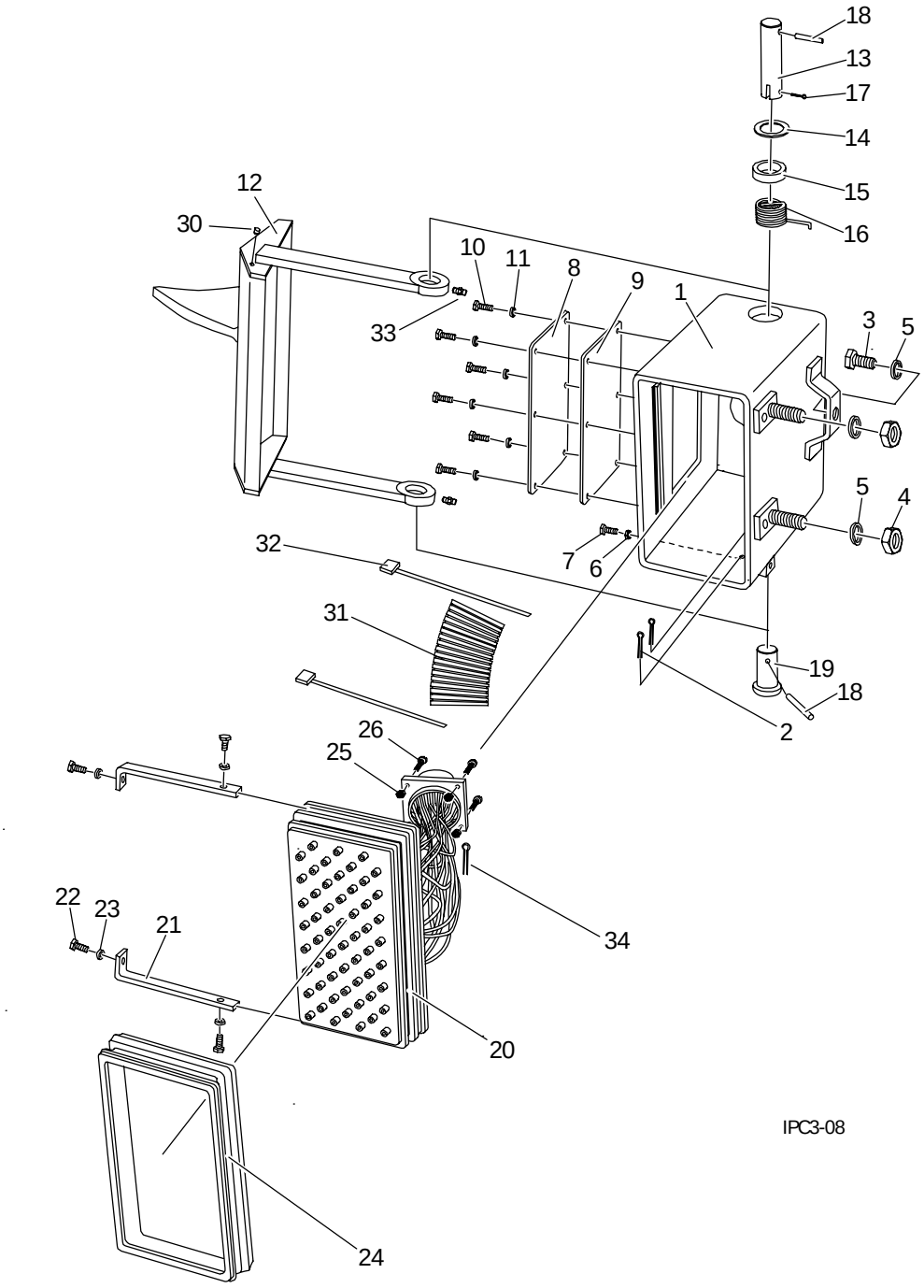


Figure 3-H. Electrical Coupler, Right

Section Figure Item	P/N	SCF Mgmt Code	MFR Code	Description	MBAT Code	U/M	Q.ty
03-H	170460			ELECTRICAL COUPLER, RIGHT, SEE FIGURE 3-3 FOR NHA			REF
01	169950			.CONTACT HOUSING			1
02	5582063036			.SPLIT PIN, 6.3x36 - S.st			1
03	5010016030			.SCREW, M6S 16x30 - S.st - ATT.PT			1
04	5353016000			.NUT, M16 - S.st - ATT.PT			2
05	5492170000			.WASHER, FBH 17x30x3 - S.st - ATT.PT			3
06	5305008000			.NUT, M6M - 8 - S.st -ATT.PT			1
07	5010008030			.SCREW, M6S 8x30 - S.st - ATT.PT			1
08	169958			..SIDE COVER			1
09	169959			..SIDE SEAL			1
10	5010008016			..SCREW, M6S 8x16 - S.st - ATT.PT			6
11	5492082000			..WASHER, FBH 8.2x16x1.5 - S.st - ATT.PT			6
12	169979			..COVER			1
13	169973			..PIN - ATT.PT			1
14	5762253510			..OIL SEAL, NBR 70° d = 25/35x7x10			1
15	170463			..BEARING, GLYCODUR A d = 1" x ¾"			1
16	169972			..SPRING			1
17	5582063036			..SPLIT PIN, 6.3x6.3 - S.st - ATT.PT			1
18	5551061044			..ROLL PIN, d = ¼"x 1 ¾" - S.st - ATT.PT			2
19	169974			..PIN - ATT.PT			1
20	170470			..CONTACT DEVICE			2
21	173293			...LOCKING PLATE			4
22	5010006012			…SCREW, M6S 6x12 - S.st - ATT.PT			4
23	5701106000			...WASHER, TM 106 - St./NBR - ATT.PT			4
24	169961			..FRONT SEAL			1
25	5353004000			..NUT, M4 - S.st - ATT.PT			4
26	5212004020			..SCREW, MCS 4x20 - S.st -ATT.PT			4
27	170805			TYPE PLATE			1
28	175654			BAR CODE PLATE			1
29	5267002005			RIVET			8
30	179974			PLUG 5mm, Black, Nylon-66			1
31	1013693			PROTECTING HOSE			1
32	5895760338			CABLE STRAP TY 27 MX			2
33	5685006001			GREASE FITTING M6 S.St			2
34	5582050032			SPLIT PIN S.St, 5x32			1

Table 3-H. Electric Coupler

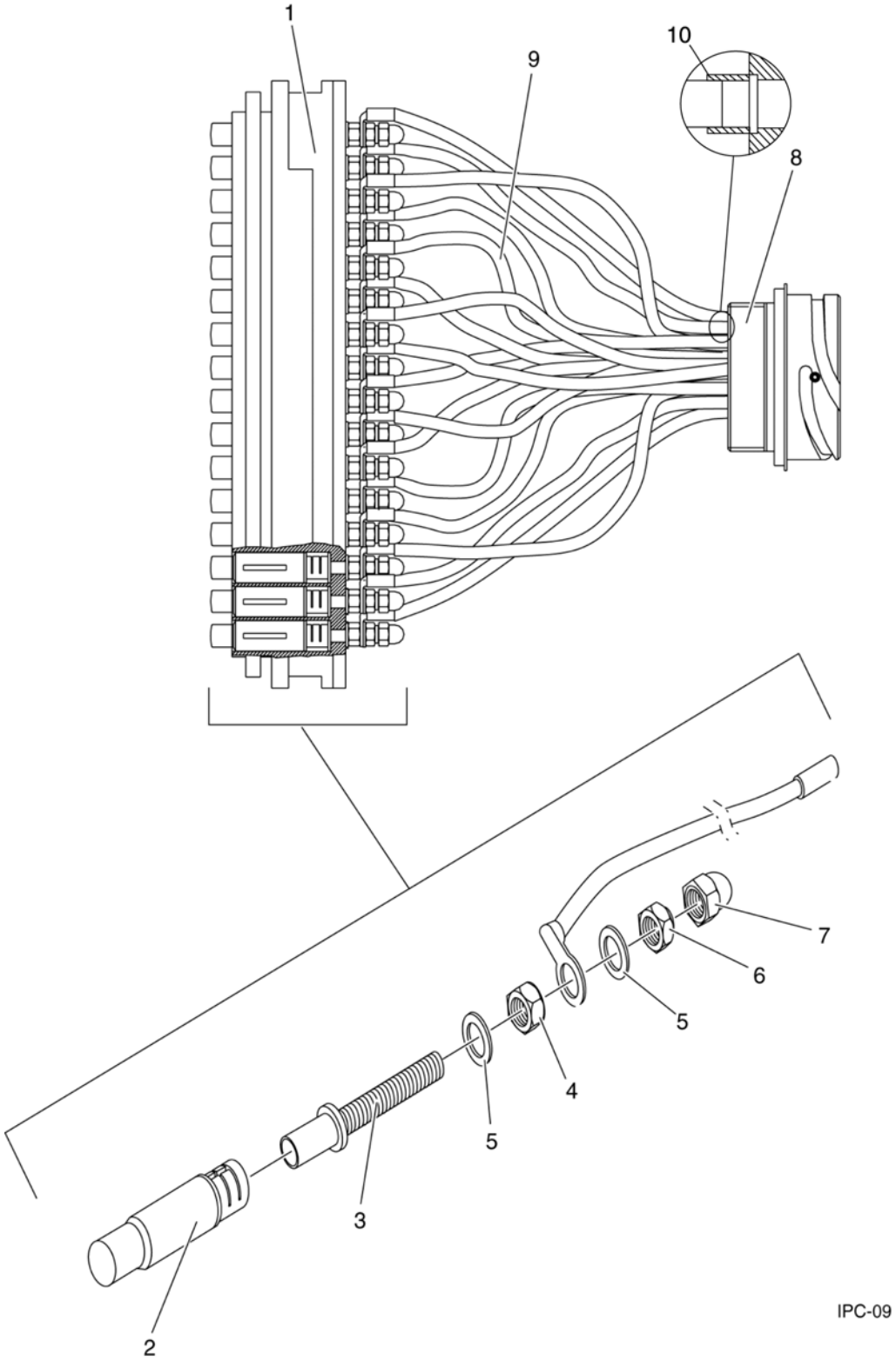


Figure 3-I. Contact Device, Left

Section Figure Item	P/N	SCF Mgmt Code	MFR Code	Description	MBAT Code	U/M	Q.ty
03-I	170462			CONTACT DEVICE, LEFT			1
01	170464			.CONTACT BLOCK, LEFT			1
02	171398			..SPRING CONTACT			56
03	154372			..SCREW - ATT.PT			56
04	5305005000			..NUT, M6M5 - S.st - ATT.PT			56
05	5453053010			..WASHER, 5.3x10x1 - BRASS - ATT.PT			112
06	5353005000			..NUT, LOC-KING M5 - S.st -ATT.PT			56
07	5403005000			..NUT, MHM5 - NYLON - ATT.PT			56
08	170471			.RECEPTACLE 0°			1
09	170467			.CABLE KIT, LEFT			1
10	168332			.SHRINK TUBE, Ø4.8, L=25			56

Table 3-I. Contact Device, Left

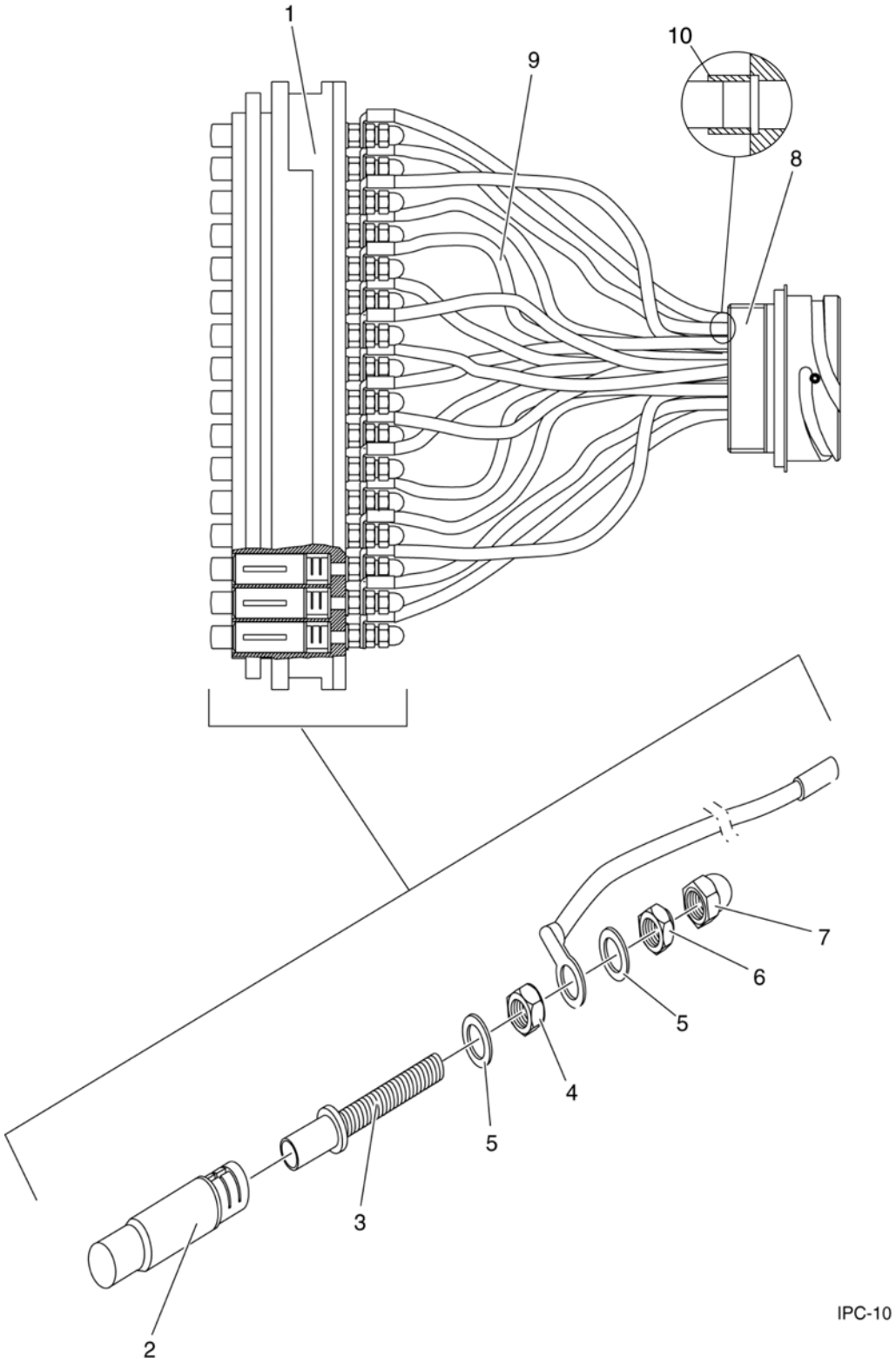


Figure 3-J. Contact Device, Right

Section Figure Item	P/N	SCF Mgmt Code	MFR Code	Description	MBAT Code	U/M	Q.ty
03-J	170470			CONTACT DEVICE, RIGHT			1
01	170465			.CONTACT BLOCK, RIGHT			1
02	171398			..SPRING CONTACT			56
03	154372			..SCREW - ATT.PT			56
04	5305005000			..NUT, M6M5 - S.st - ATT.PT			56
05	5453053010			..WASHER, 5.3x10x1 - BRASS - ATT.PT			112
06	5353005000			..NUT, LOC-KING M5 - S.st -ATT.PT			56
07	5403005000			..NUT, MHM5 - NYLON - ATT.PT			56
08	170469			.RECEPTACLE 80°			1
09	170468			.CABLE KIT, RIGHT			1
10	168332			.SHRINK TUBE, Ø4.8, L=25			56

Table 3-J. Contact Device, Right

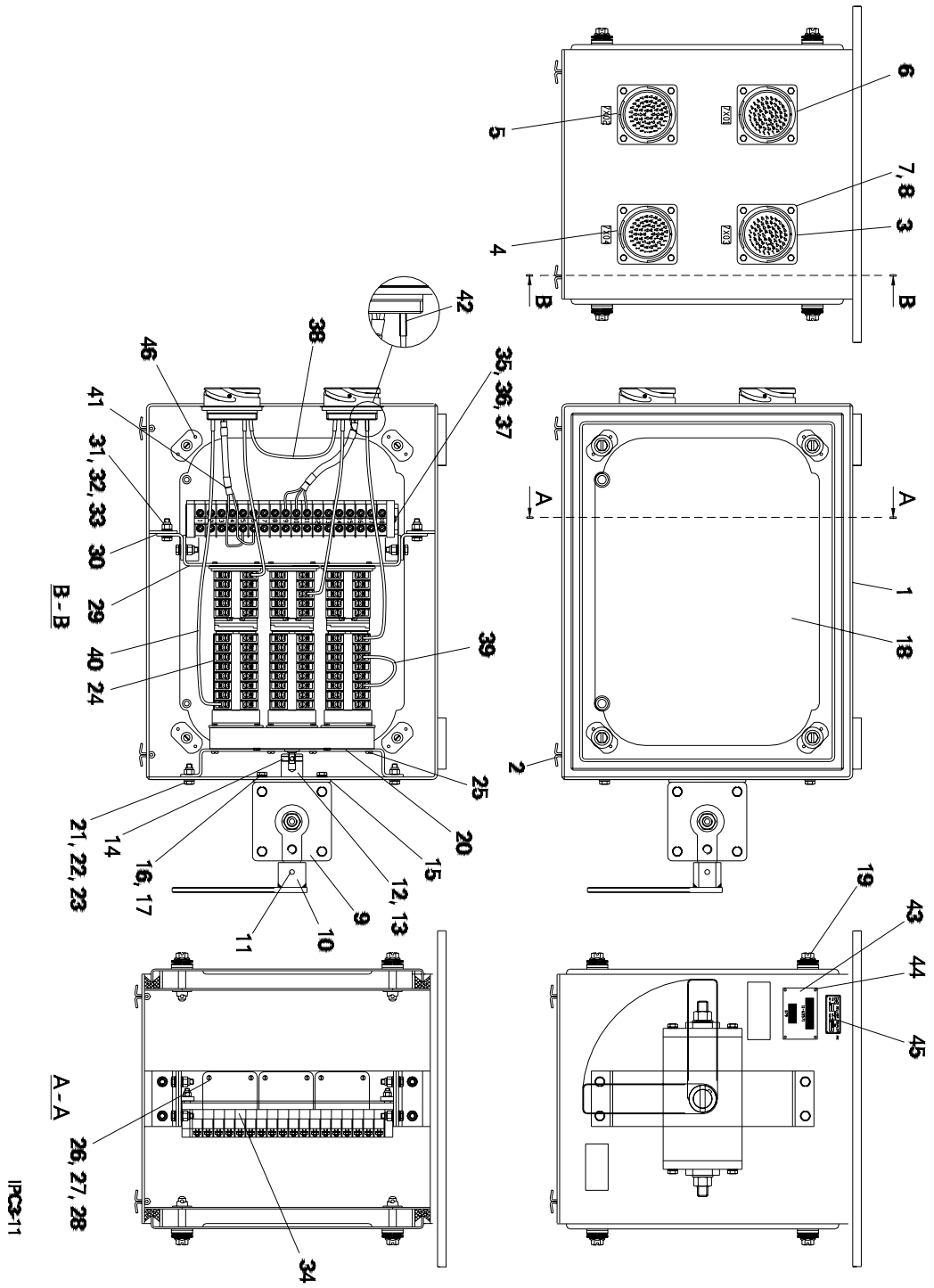


Figure 3-K. Control Box

Section Figure Item	P/N	SCF Mgmt Code	MFR Code	Description	MBAT Code	U/M	Q.ty
03-K	165571			CONTROL BOX			1
01	173759			.BOX			1
02	5582050036			.SPLIT PIN, SP 5x36 - S.st			4
03	173756			..RECEPTACLE 80°, SOCKET			1
04	173755			..RECEPTACLE 0°, SOCKET			1
05	174019			..RECEPTACLE 0°, PIN			1
06	174020			..RECEPTACLE 80°, PIN			1
07	5010004020			..SCREW, M6S 4x20 - S.st - ATT.PT			16
08	5353004000			..LOCK NUT, M4 - S.st - ATT.PT			16
09	163319			..ROTARY ACTUATOR			1
10	163325			…MANUAL HANDLE			1
11	5551061032			…COTTER PIN, FRP 6x32 - S.st - ATT.PT			1
12	173288			…SHAFT			1
13	163547			…KEY, 3/16x3/16x8			1
14	5131006012			…STOP SCREW, 6x12 - S.st			1
15	173287			..SEAL			1
16	5036006019			..SCREW, U6S 1/4x3/4 - S.st - ATT.PT			4
17	5492061000			..WASHER, FBH 6.1 - S.st			4
18	173286			.COVER			2
19	174026			.1/4-SCREW, COMPLETE - ATT.PT			8
20	173289			..BRACKET PLATE			1
21	5010006022			..SCREW, M6S 6x22 - S.st - ATT.PT			4
22	5353006000			..LOCK NUT, M6 - S.st - ATT.PT			4
23	5701106000			..WASHER, TREDO TM 106 - S.st - NBR - ATT.PT			4
24	173277			.SWITCH C10			1
25	5259010190			.SCREW, RXS B10x19 - ATT.PT			12

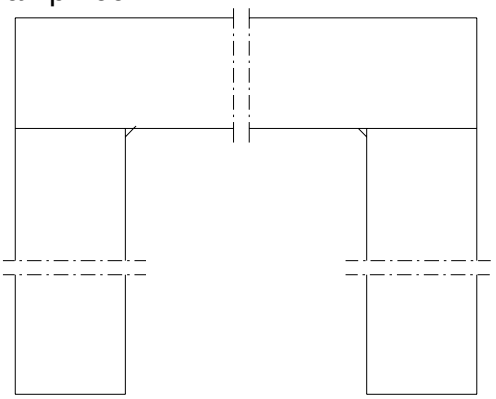
Section Figure Item	P/N	SCF Mgmt Code	MFR Code	Description	MBAT Code	U/M	Q.ty
26	5010004020			.SCREW, M6S 4x20 - S.st - ATT.PT			12
27	5477043000			.WASHER, BRB 4.3x8x0.8			12
28	5353004000			.LOCK NUT, M4 - S.st - ATT.PT			12
29	174031			..BRACKET PLATE			1
30	173291			..BRACKET PLATE			2
31	5353006000			..LOCK NUT, M6 - S.st - ATT.PT			8
32	5477064000			..WASHER, BRB 6.4x12x1 - S.st - ATT.PT			20
33	5010006022			..SCREW, M6S 6x22 - S.st - ATT.PT			8
34	174029			.TERMINAL			1
35	5053005020			.SCREW, MC6S 5x20 - S.st - ATT.PT			2
36	5353005000			.LOCK NUT, M5 - S.st - ATT.PT			2
37	5477053000			.WASHER, BRB 5.3x10x1 - S.st - ATT.PT			4
38	174017			.CABLE KIT			1
39	174023			.CABLE KIT			1
40	174016			.CABLE KIT			1
41	174032			.CABLE KIT			1
42	168332			SHRINK TUBE, Ø4.8 L=25			207
43	175655			BAR CODE SIGN			1
44	5267002005			RIVET			8
45	174025			TYPE PLATE			1
46	5586032080			RIVET			16

Table 3-K. Control Box

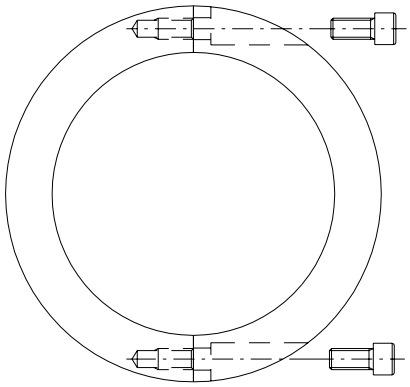
Section Figure Item	P/N	SCF Mgmt Code	MFR Code	Description	MBAT Code	U/M	Q.ty
	1002712			CLAMP			1
	169099			COMPRESSION RING			1
	168820			WRENCH			1
	153702			WRENCH			1
	179925			WRENCH			1
	186916			CONTACT DISASSEMBLY TOOL			1
	186917			CONTACT ASSEMBLY TOOL			1
	178454			NO-GO GAUGE, COUPLER THROAT			1
	178455			NO-GO GAUGE, COUPLER HOOK			1
	178456			GO GAUGE, PULLING FACE			1
	1003706			BUFFER CLAMP			1
	1030172			ATTACHMENT			1

Special tools

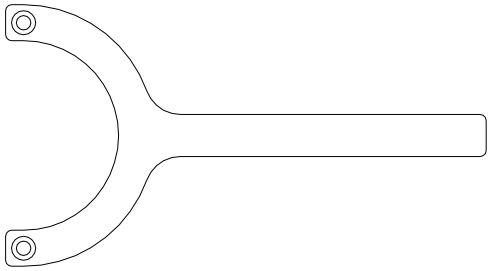
Clamp 1002712



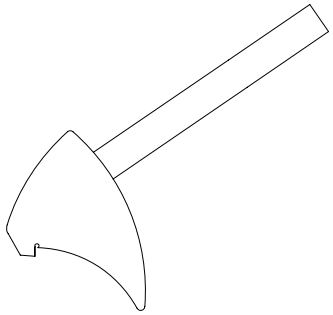
Compression ring 169099



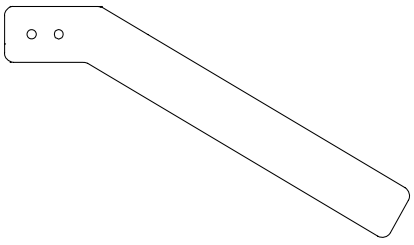
Wrench 168820



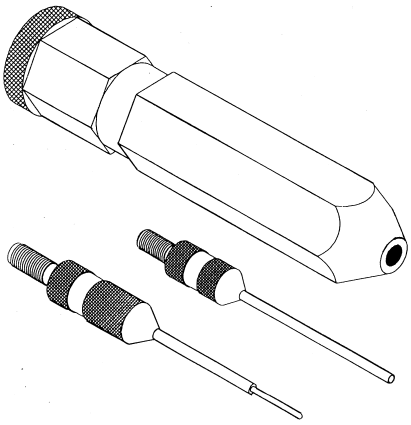
Wrench 153702



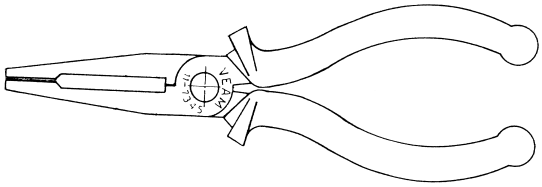
Wrench 179925



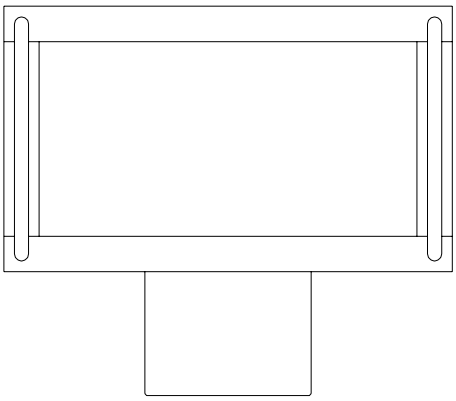
Contact disassembling tool 186916 (DRK996)



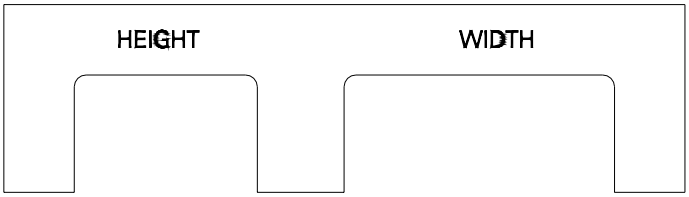
Contact assembly tool 186917 (11-7345)



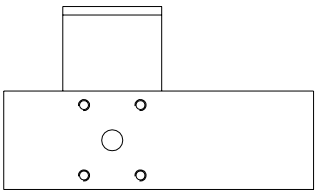
No-GO gauge, Coupler throat (178454)



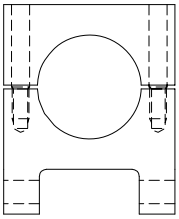
No-GO gauge, Coupler hook (178455)



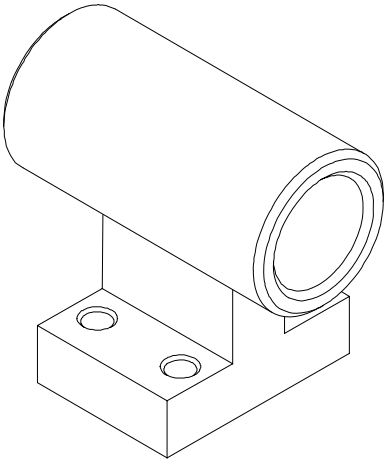
GO-gauge, Pulling face (178456)



Buffer clamp (1003706)



Attachment (1030172)



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1		General updates, Fig. des. in tables changed		2003-03-03
	3-A	Fig. 3-A updated and part no. changed. Part no. 2,3,4 added		
	3-B	Part no. 44 was 5058010070		
	3-C	Part no. 13 was 5016010035 Part no. 21 was 5777160040 Part no. 46 and 47 "A4" added		
	3-D	Part no. 17, 18 and 19 moved to 3-A		
	3-E	Figure, part list revised acc. to drawing 11-70823		
	3-F	Figure 3-F updated Part no. 8 removed Part no. 26 was tube SS2333 Part no. 27 and 28 added		
	3-G	Figure 3-G updated Part no. 29 was 2567002005 Part no. 30 added		
	3-H	Figure 3-H updated Part no. 29 was 2567002005 Part no. 30 added		
	3-I	Figure 3-I updated Part no. 10 added		
	3-J	Figure 3-J updated Part no. 10 added		
	3-K	Figure 3-K updated Part no. 19 was 174046 Part no. 30 Qty was 1 Part no. 32 Qty was 16 Part no. 42,43,44,45 and 46 added		
	Special Tools	Tool 178454, 178455, 178456 added		
2	3-C	Description of figure changed	3-6	2007-01-08
	3-F	Part no. 4 was 151356 Part no. 17 was 167375	3-15	
	3-G	Part no. 14 was 5030025035 Part no. 31-34 added, Figure updated	3-17	
	3-H	Part no. 14 was 5030025035 Part no. 31-34 added, Figure updated	3-19	
	Special tools	Tools (Buffer clamp and attachment) added	3-27 and 3-30	

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n

SCHEDULED MAINTENANCE AND OVERHAUL MANUAL

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1	3	Figures 3-1, 3-7, 3-8, 3-10, 3-11, 3-12, and 3-18 replaced.	3-2, 3-14, 3-16, 3-20, 3-22, 3-24 and 3-43	991006
2	3	3.2.8.8 preloading added 3.2.8.5 tool nrs added 3.2.7.3 special tool excluded 3.2.4.4 tool nrs added 3.2.1.1 Fig 3-3, Table 3-3, pos added	3-7,3-8, 3-52, 3-71, 3-78, 3-82,	2001-08-28
3	3	Draft gear and buffer, Assembly of draft gear instruction updated	3-81,3-82	2003-02-20
4	3.2.1 3.2.1.1 3.2.1.2 3.2.1.3 3.2.1.4 3.2.1.5 3.2.1.6 3.2.4.1 3.2.4.2 3.2.4.3 3.2.4.5 3.2.4.6 3.2.8.3 3.2.8.4 3.2.8.5 3.2.8.6 3.2.8.7 3.3.1.2 3.3.1.3	Figure 3-1 updated. Figure 3-2 and 3-3 updated. Table 3-2 updated. Figure 3-4 and 3-6 updated. Figure 3-7 updated. Figure 3-8 updated. Figure 3-10 and 3-11 updated. Table 3-9 updated Figure 3-12 updated. Figure 3-16 updated. Instruction updated. Figure 3-20 and 3-21 updated. Instruction updated. Pre-load added. Instruction updated. Instruction updated. Instruction updated. Instruction updated. Instruction updated. Instruction updated. Instruction updated.	3-2 3-4 – 3-7 3-9, 3-12 3-14 3-16 3-20 – 3-22 3-24 3-38 3-41 – 3-43 3-46 – 3-50 3-54 3-55 3-78 3-79 3-80 – 3-82 3-83 – 3-84 3-85 3-88 3-88	030630

5	3.2.1.6 3.2.61 3.2.4.3 3.2.6.1 3.2.8.1 3.2.8.6	Figure 3-12 and Table 3-11 updated with new parts Instructions updated Figure 3-17 and Table 3-18 updated with new parts Instructions updated Instruction of coupler collision check added Tightening torques updated Instructions of Mounting of mechanical coupler updated	3-24 – 3-25 3-39 3-40 – 3-41 3-45 – 3-46 3-71 – 3-72 3-76 3-85 – 3-86	070109

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3 Coupler

3.1 Maintenance Matrix

SYSTEM/ ASSEMBLIES/ COMPONENTS	TASK	INSPECTIONS INTERVALS MILES			PARA
		10,000 2,5 Y	200,000 5 Y	400,000 10 Y	
Automatic coupler	Overhaul		●		3.3.1

3.2 Heavy Maintenance

3.2.1 Description and Theory of Operation

The Dellner Coupler with the hook mechanism, Figure 3-1, enables rail vehicles to couple automatically. Coupling is accomplished without manual assistance, even at low speeds between rail cars, and results in a rigid, slack free and fully latched connection. The coupler has a three-axis pivot which provides for free movement over all vertical and horizontal track variations.

Automatic coupling of the electric heads, which carry the train line electrical requirements, occurs as mechanical coupling is completed.

Uncoupling of the unit is done by a signal from the operator's console. Once parted, the couplers are automatically reset to a "ready-to-couple" condition.

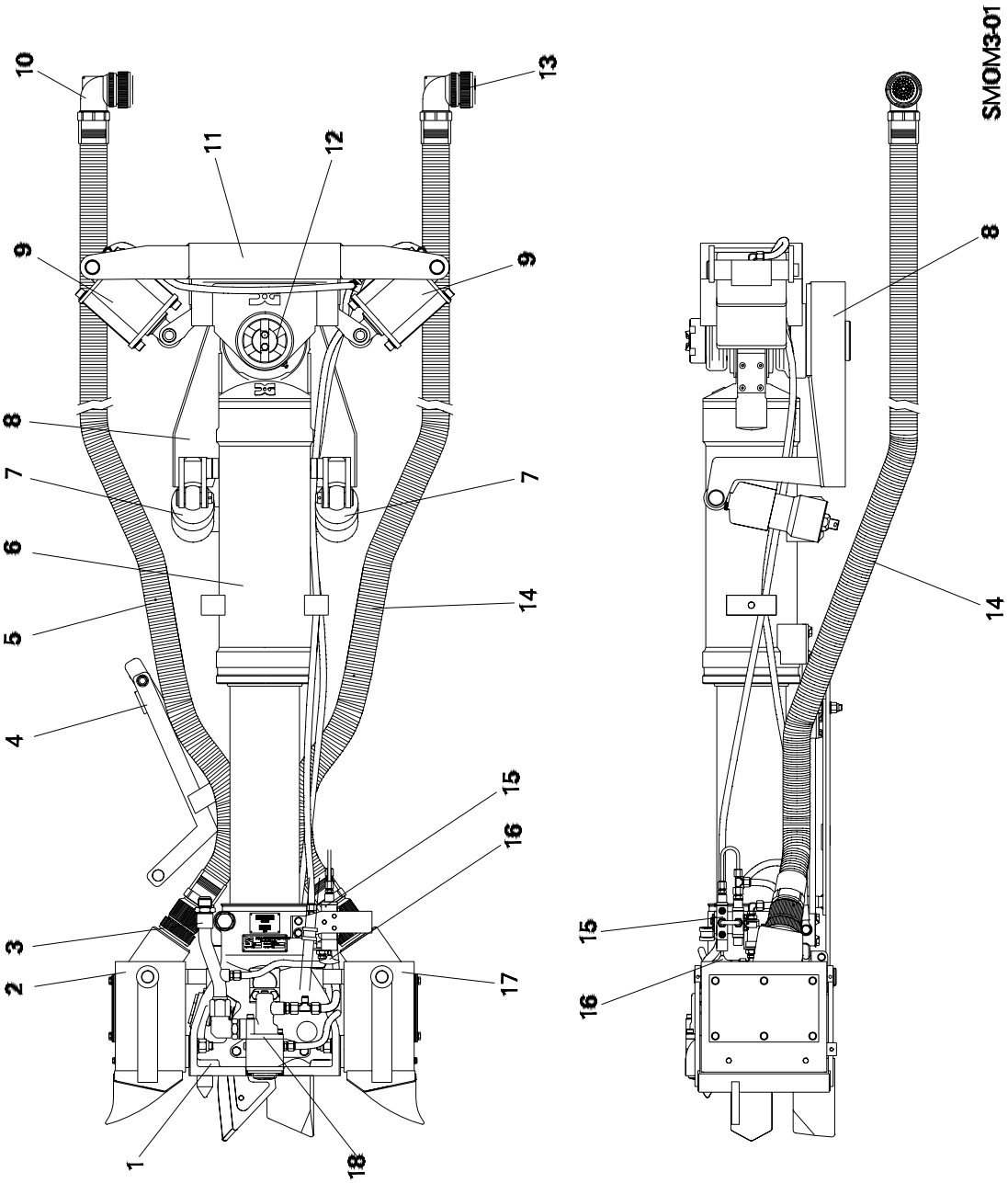

Figure 3-1. Automatic Coupler

Item	Description	Item	Description
1	Mechanical coupler	10	Connector, control box, right
2	Electrical coupler, right	11	Centring suspension
3	Main reservoir pipe (hose)	12	Bearing bracket
4	Uncoupling handle	13	Connector, control box, left
5	Cable assembly, right	14	Cable assembly, left
6	Buffer	15	Pneumatic valve (5/2-valve)
7	Support spring	16	Release handle, centring device
8	Support plate	17	Electrical coupler, left
9	Centring cylinder	18	Pneumatic coupler

Table 3-1. Items in Figure 3-1

3.2.1.1 Mechanical Coupler

The mechanical coupler, figure 3-2, comprises the mechanical coupler head, a buffer, a vertical support spring, a centring device and a bearing bracket with a spherical rubber bearing.

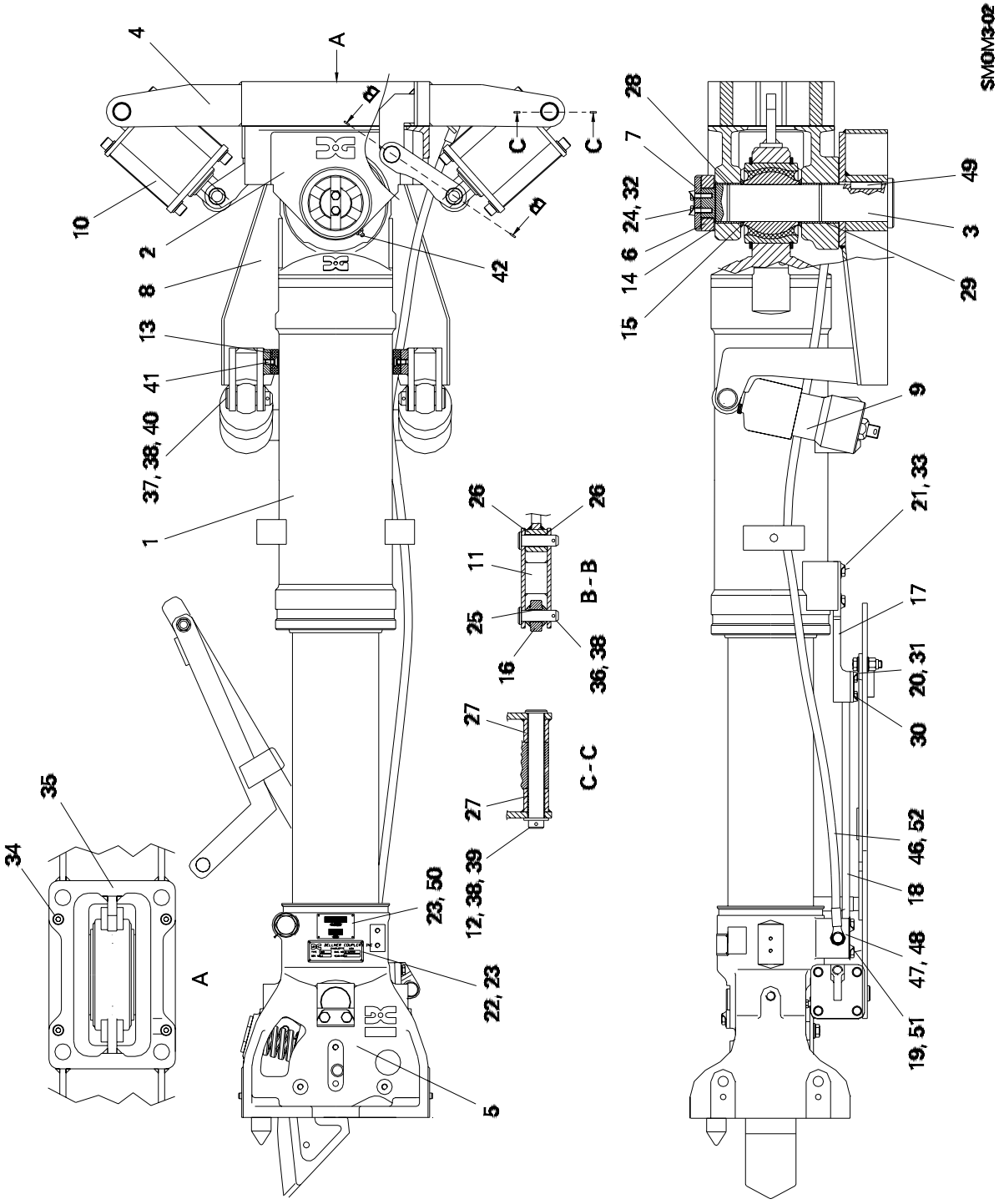

Figure 3-2. Mechanical coupler

Item	Description	Item	Description
1	Buffer	26	Bearing
2	Bearing bracket	27	Bearing
3	Pin	28	Bearing
4	Centring suspension	29	Bearing
5	Mechanical coupler head	30	Cover
6	Nut	31	Screw
7	Key	32	Screw
8	Support plate	33	Screw
9	Support spring	34	Screw
10	Centring cylinder	35	Slotted pin
11	Link	36	Cylinder pin
12	Pin	37	Cylinder pin
13	Bearing	38	Split pin
14	Washer	39	Washer
15	Thrust washer	40	Washer
16	Roller	41	Screw
17	Guide bar	42	Grease fitting
18	Guide rail	46	Ground cable
19	Securing plate	47	Screw
20	Securing plate	48	Washer
21	Securing plate	49	Key
22	Type plate	50	Bar code sign
23	Rivet	51	Screw
24	Securing plate	52	Protective spiral
25	Bearing		

Table 3-2. Items in figure 3-2

The mechanical coupler head, figure 3-3, is a hook-type, flat face, tight lock transit coupler, designed to provide positive horizontal and vertical alignment of the couplers when in a coupled arrangement. The coupler head contains a steel forging in the form of a hook which acts as the initial guide member for gathering during coupling. Projecting guide pins and recess bushings on the coupler face serve to positively align the pneumatic and electrical connections between coupled cars. The coupler has a lateral line-up, or gathering range, at the coupler face 5 inches to the left and right of the centre line of the opposing coupler. The coupler has a vertical line-up, or gathering range, at the coupler

face to permit automatic coupling if the coupler of one car is within 3 inches above or below the centre line of the opposing coupler.

While two couplers are coupled, draft (tension) forces are taken by the coupler hooks while buff (compression) forces are taken by the flat coupler faces. Each coupler head is supported by a draft gear which permits vertical and roll movements.

Uncoupling of the mechanical head can be accomplished either remotely from the driver's cab or at the coupler itself by using a manual release handle. Remote uncoupling is effected by compressed air by means of an uncoupling device. The uncoupling device is a pneumatic cylinder mounted on the underside of the mechanical head and is operated by an uncoupling control valve. When activated the uncoupling device rotates the uncouple cam causing the coupler hooks to become unfastened. The uncoupling device can also be activated manually by pulling a handle on the right side of the coupler.

It is recommended that the couplers are relaxed or buffed when uncoupling. To be able to uncouple the couplers manually the couplers have to be relaxed or buffed, otherwise the force that must be applied to the handle becomes too large. Once the rail vehicles have moved apart, the couplers automatically reset and are ready to be coupled again.

Electrical couplers are mounted on each side of the coupler head and a pneumatic tappet valve for connecting the air lines is fitted into the upper section of the head.

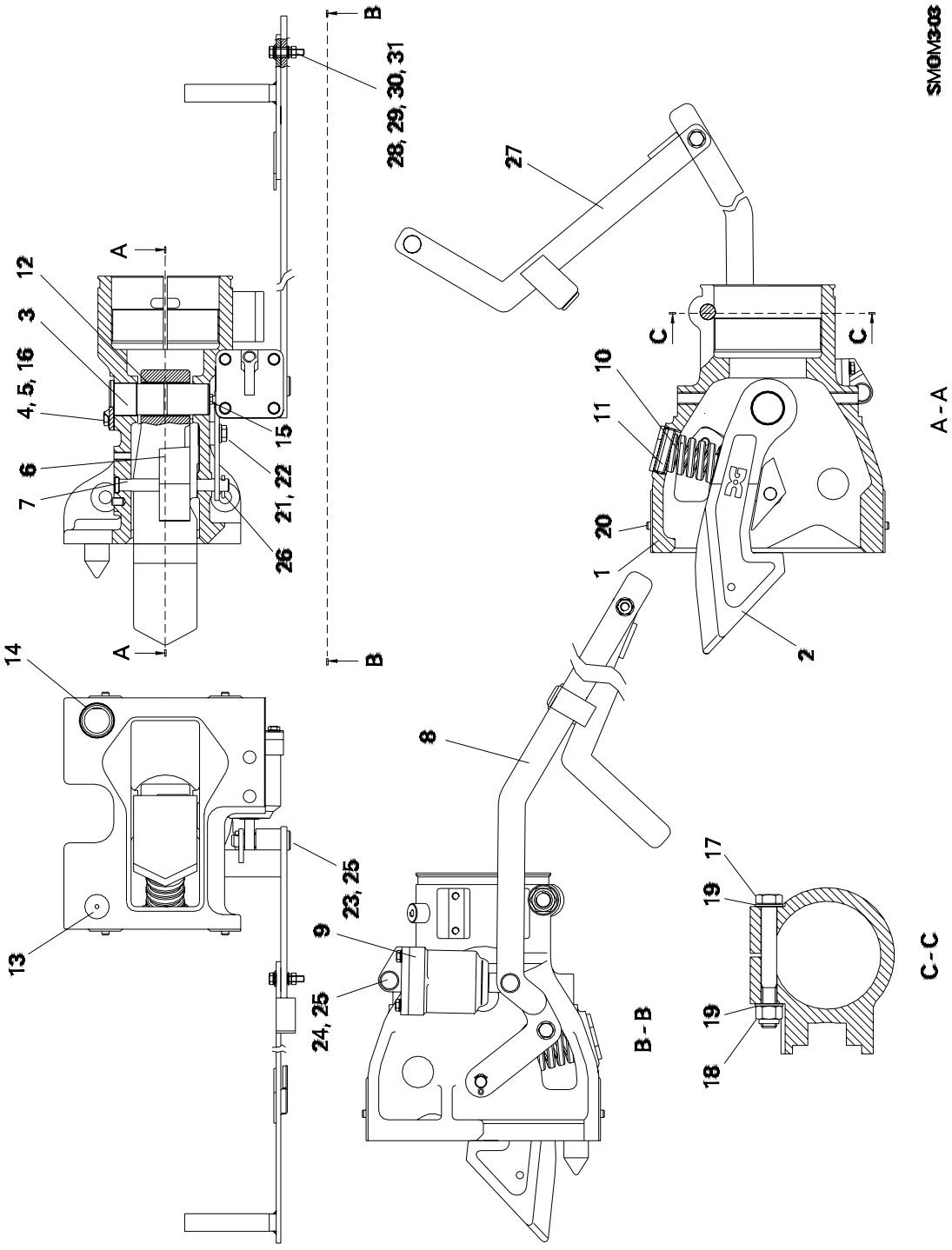

Figure 3-3. Mechanical coupler head

Item	Description	Item	Description
1	Coupler head housing	17	Screw (clamp bolt)
2	Hook	18	Nut
3	Main pin	19	Washer
4	Securing washer	20	Cylinder pin
5	Securing plate	21	Screw
6	Uncoupling cam	22	Washer
7	Uncoupling shaft	23	Cylinder bolt
8	Uncoupling arm	24	Cylinder bolt
9	Uncoupling cylinder	25	Split pin
10	Coil spring	26	Split pin
11	Spring support	27	Fold arm
12	Bearing	28	Nut
13	Guide pin	29	Bushing
14	Guide bushing	30	Screw U6S
15	Grease fitting	31	Washer RB
16	Screw		

Table 3-3. Items in figure 3-3

3.2.1.2 Draft Gear and Buffer

The draft gear and buffer, Fig. 3-4 contains resilient components that work in both the buff and draft directions. The draft gear has a ring spring which works during draft conditions. A spherical, elastic bearing at the anchor pivot point allows for both horizontal and vertical track variations. The spherical elastic bearing, figure 3-6, eliminates a wear point, reduces noise and improves ride quality with respect to the coupler draft gear action. In addition the coupler includes a self-restoring energy absorbing device, in the form of a hydraulic buffer, figure 3-5, which automatically resets after uncouple and eliminates the need for emergency shear bolts.

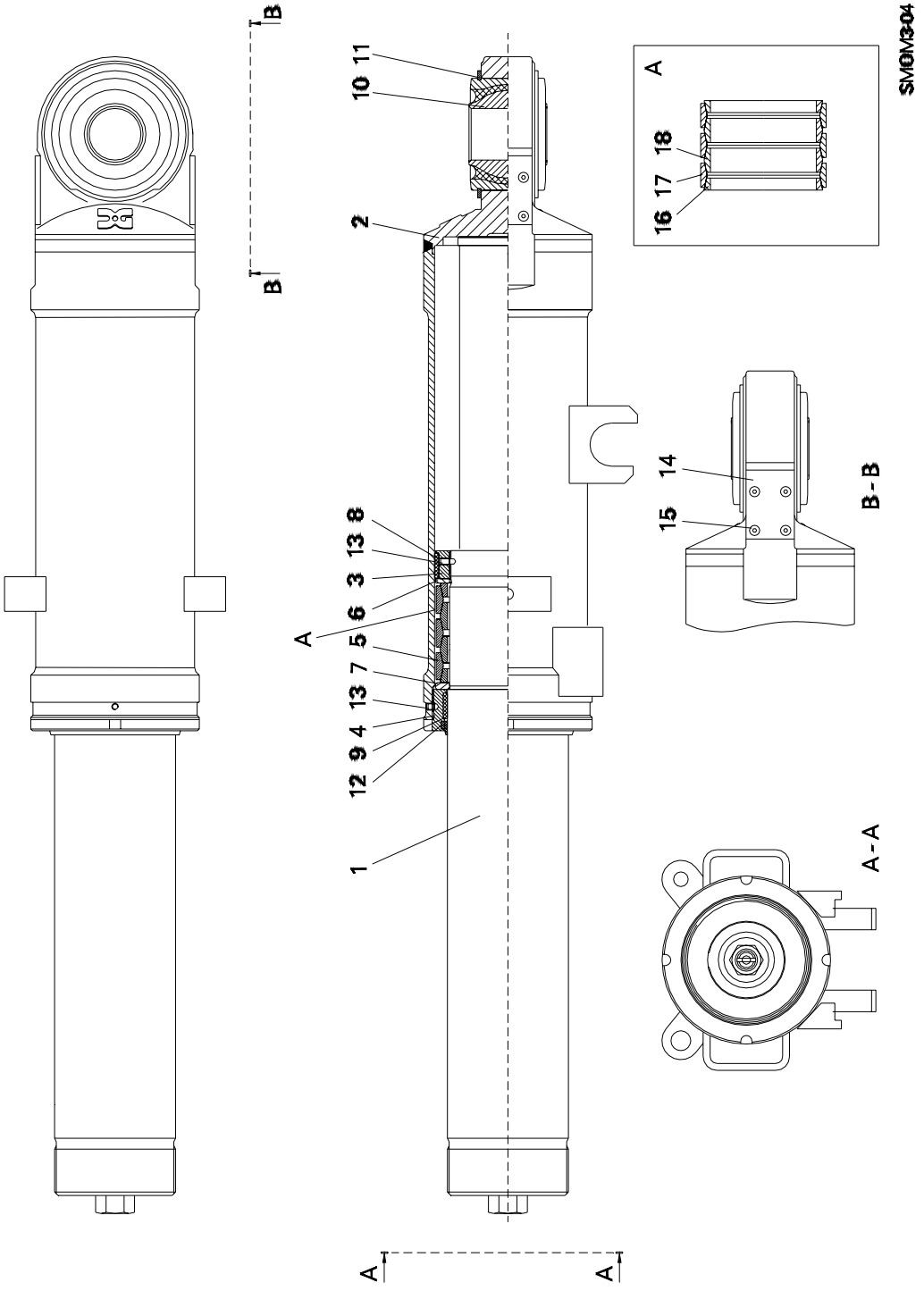

Figure 3-4. Buffer

Item	Description	Item	Description
1	Hydraulic buffer	10	Spherical rubber bearing
2	Buffer tube	11	Retaining ring
3	Nut	12	Stripper
4	Nut	13	Stop screw
5	Ring spring	14	Wear plate
6	Ring	15	Screw
7	Ring	16	Half inner ring
8	Bearing	17	Outer ring
9	Bearing	18	Inner ring

Table 3-A. Items in figure 3-4

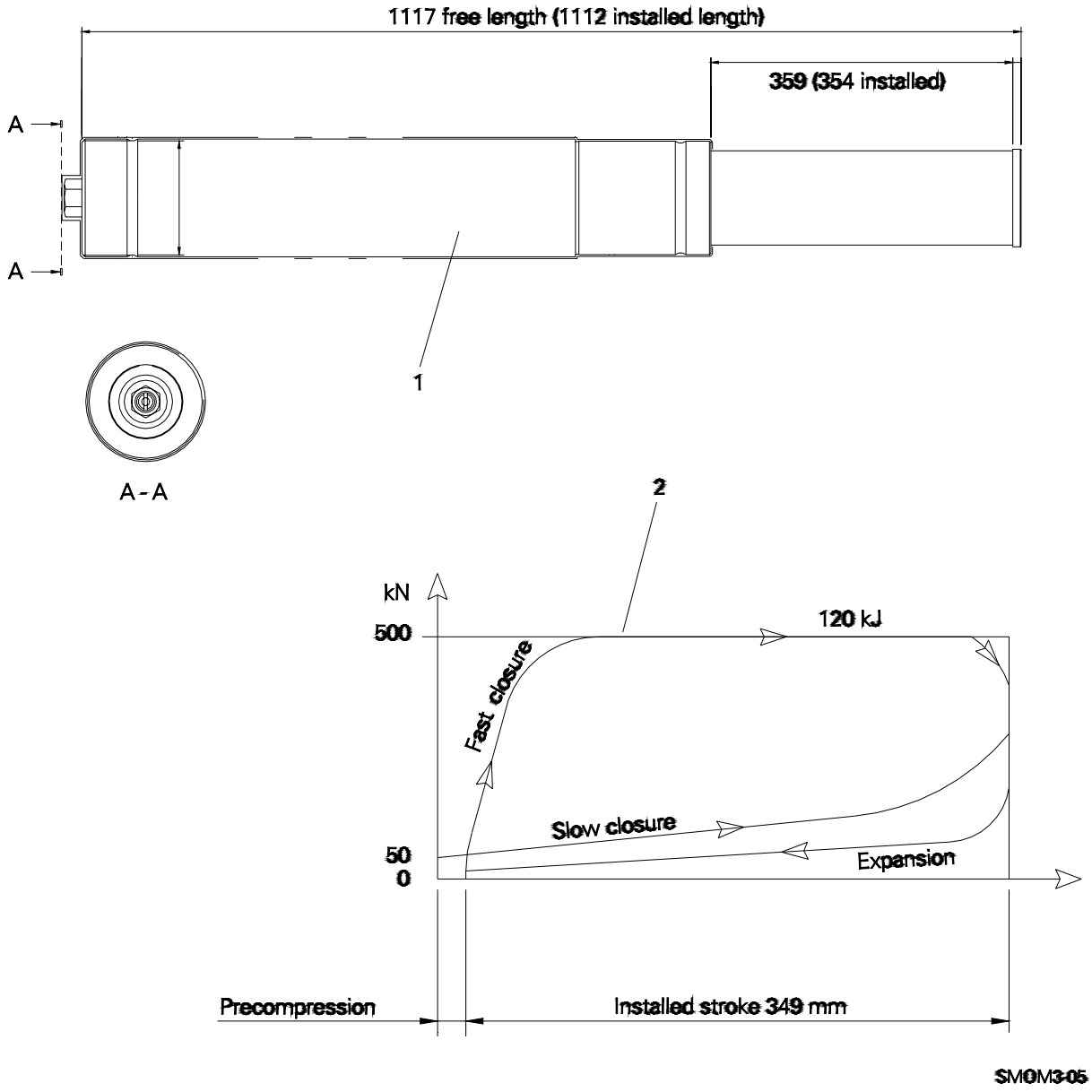

Figure 3-5 Hydraulic buffer and working diagram

Item	Description	Item	Description
1	Hydraulic buffer	2	Working diagram

Table 3-4. Items in figure 3-5.

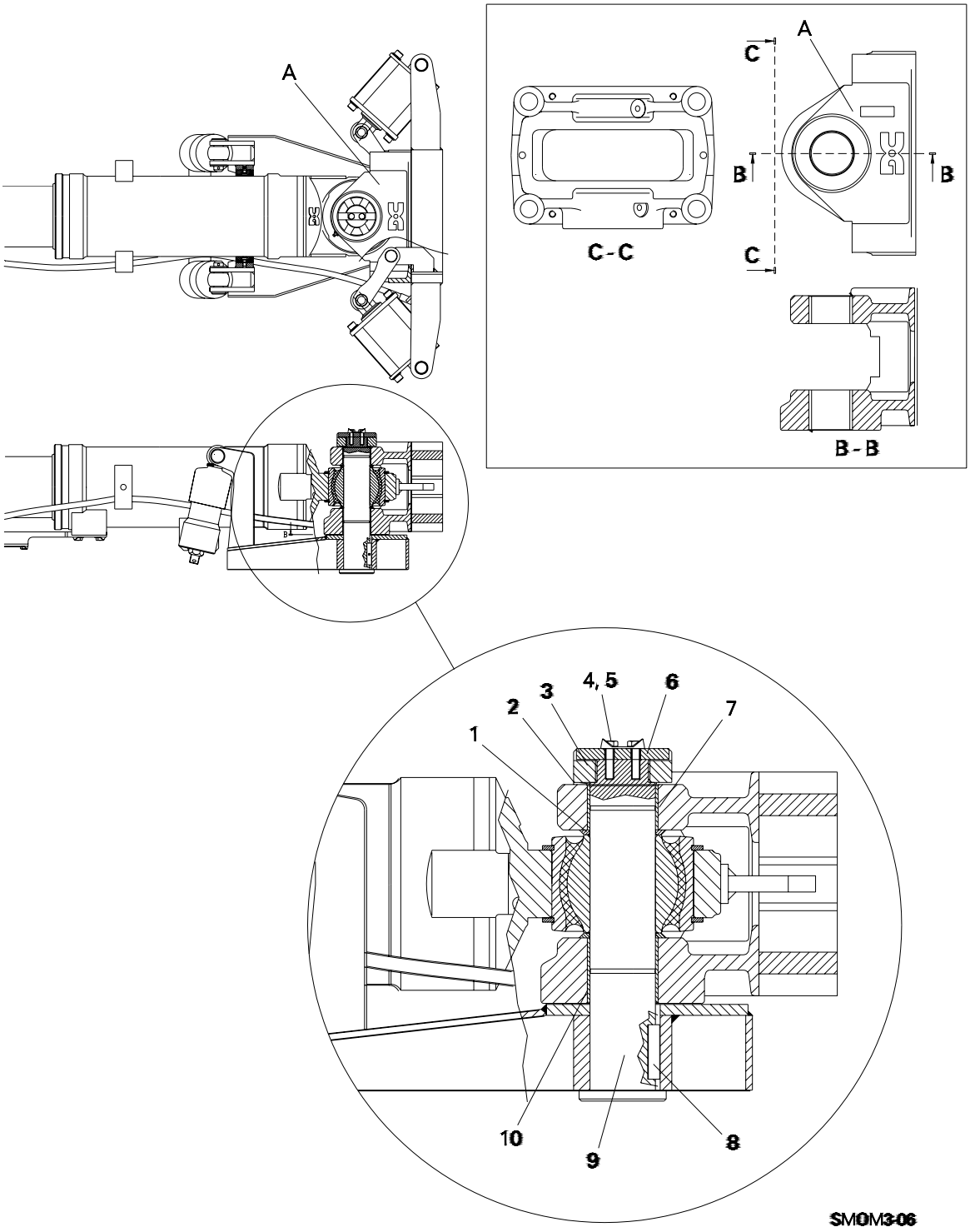

Figure 3-6. Spherical rubber bearing and bearing bracket

Item	Description	Item	Description
1	Thrust washer	6	Key
2	Washer	7	Bearing
3	Nut	8	Key
4	Screw	9	Pin
5	Securing plate	10	Bearing

Table 3-5. Items in figure 3-6

3.2.1.3 Vertical Support and Height Adjustment

The coupler includes a self-support arrangement. The self-support arrangement has two parts: the support plate (8) and the support spring (9), figure 3-2. The support spring, figure 3-7, has two springs that maintain the free coupler in proper horizontal position. Adjustment nuts are provided at each spring. Independent of adjustment the vertical support always allows the coupler to articulate.

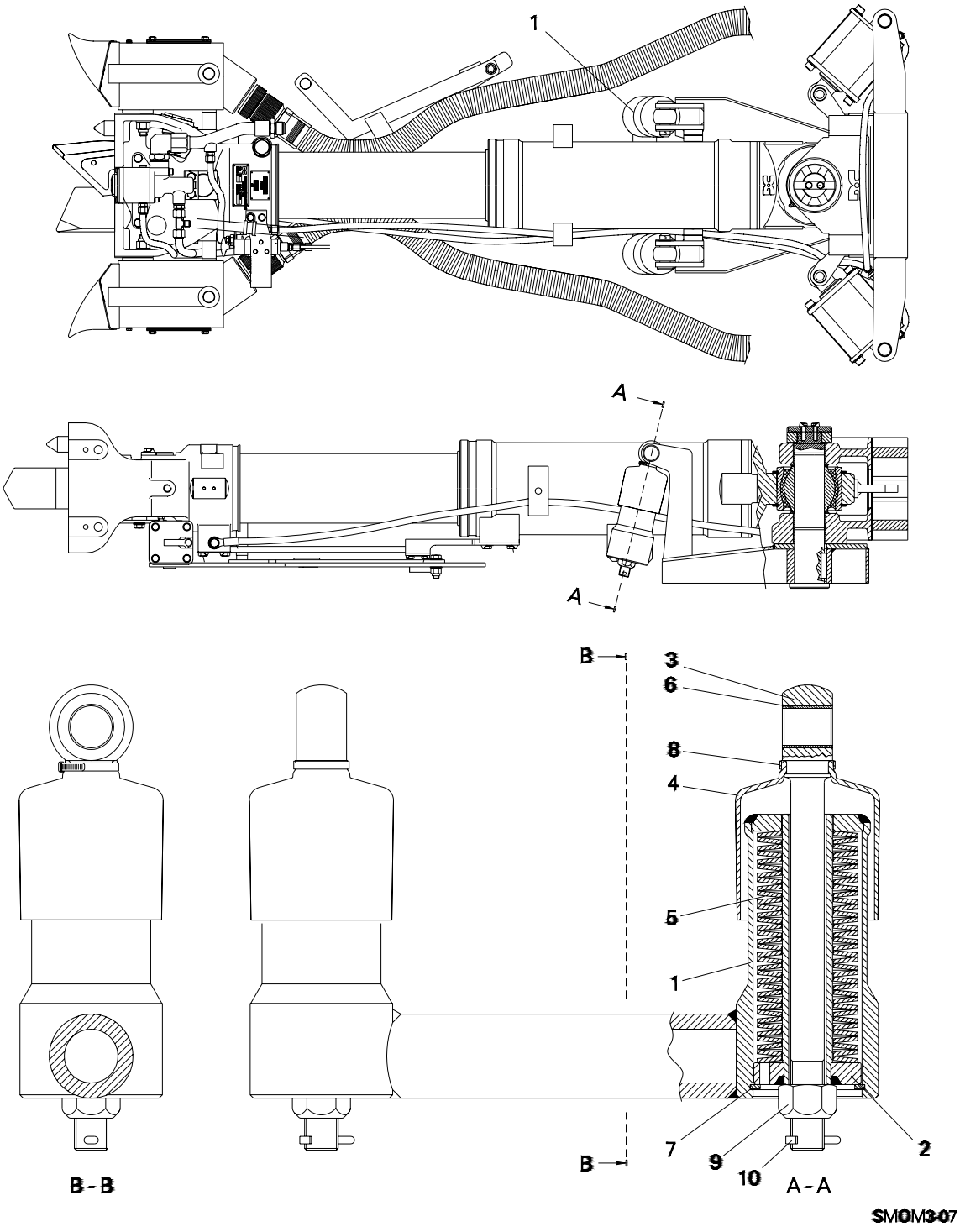

Figure 3-7. Support spring

Item	Description	Item	Description
1	Spring casing	6	Plain bearing
2	Guide sleeve	7	Clamp ring
3	Draft bar	8	Strip
4	Protective housing	9	Nut
5	Disk spring	10	Split pin

Table 3-6. Items in figure 3-7

3.2.1.4 Centring Device

The centring device, figure 3-8, comprises two pneumatic cylinders called centring cylinders (A). When two vehicles are coupled, the centring cylinders are de-activated and the couplers are permitted to move laterally (as well as vertically). When the vehicles are uncoupled, the system is activated and the centring cylinders push the coupler on centre and retain it there. It is possible to release the pneumatic system for manual alignment, e g for coupling when vehicles are standing in a curve. The centring cylinders are released by pushing the handle of the valve (10), figure 3-10.

An audible noise (air going through a choke) will alert that the centring device is released to prevent that someone forgets that the centring has been released and starts the train. The valve (10) will automatically be reset when coupling is performed, meaning that the centring device will be pressurised the next time uncoupling is performed.

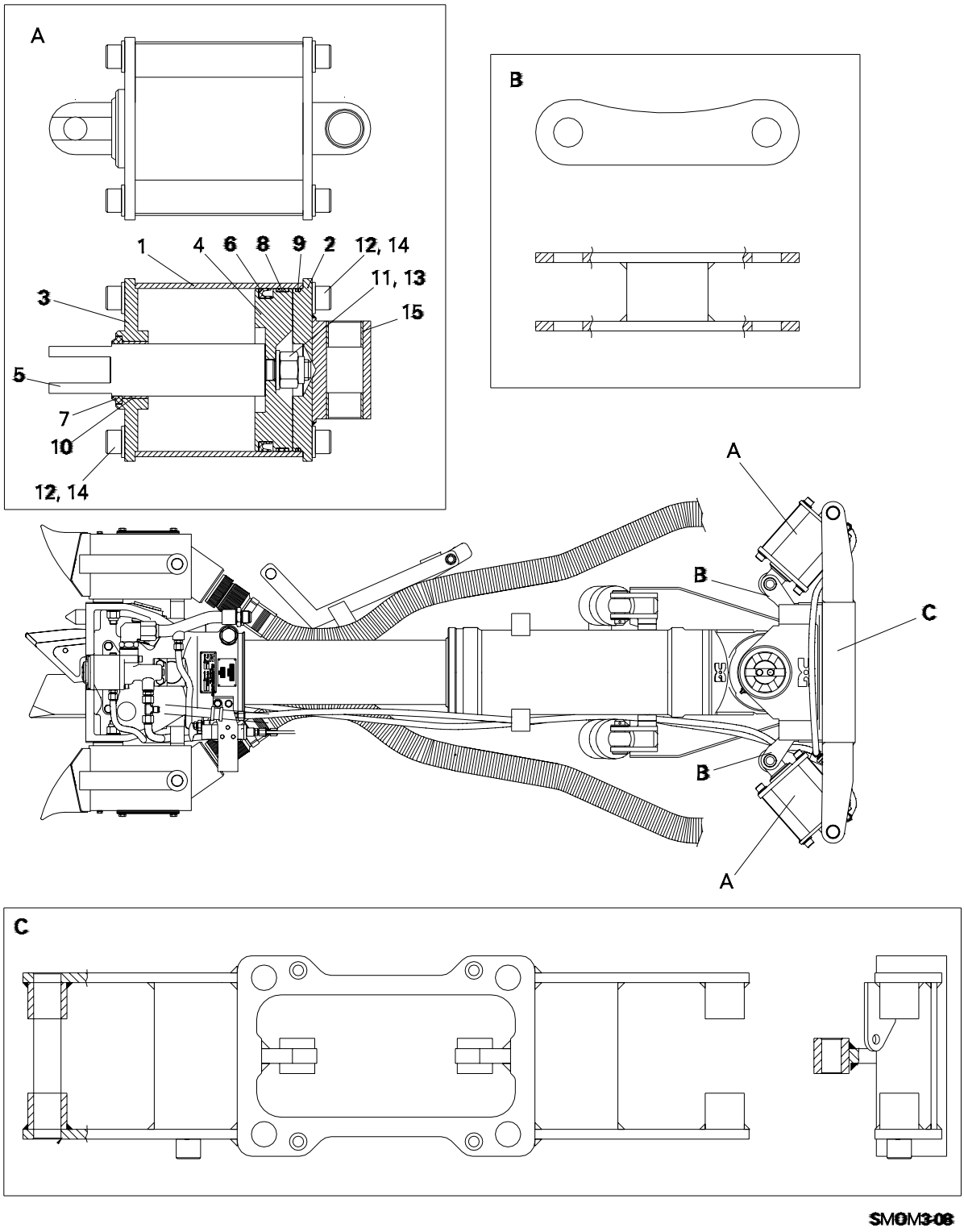

Figure 3-8. Centring device

Item	Description	Item	Description	Item	Description
1	Tube	7	Wiper	13	Washer
2	Gable	8	Bearing	14	Washer
3	Gable	9	O-ring	15	Bearing
4	Piston	10	Bearing	A	Centring cylinder
5	Piston rod	11	Nut	B	Link
6	Piston seal	12	Screw	C	Centring suspension

Table 3-7. Items in figure 3-8

3.2.1.5 Pneumatic system

The pneumatic system includes two solenoid valves: a single solenoid valve, (1) figure 3-9, for mechanical uncoupling and a duplex solenoid valve, (2) and (3), for operation of the control box switch actuator. The duplex solenoid valve comprises two single solenoid valves denominated UCSV and CSV. When valve UCSV is pressurised and CSV is shut off, the switch actuator makes the control box switch to uncoupled state. When CSV is pressurised and UCSV is shut off, the switch actuator makes the control box switch to coupled state.

The pneumatic coupler, figure 3-11, has a tappet valve which opens the MRP airline during coupled state and shuts off the MRP airline during uncoupled state. When the pneumatic coupler is in the uncoupled state it provides air pressure to the centring device to hold the coupler in the centre position. In the coupled state air from the pneumatic coupler makes the valve (9), figure 3-9, shut off the supply air to the centring cylinder and the valve (10) allows air to exhaust from the centring device which allows the coupler to move freely while the cars negotiate lateral curves. In uncoupled state, the pneumatic centring can be shut off manually by pushing a handle (12) on valve (10).

When the handle is pulled, the supply air is directed to an outlet through a choke (11). The supply air will rush out through the choke causing an alerting noise. The air in the centring cylinders is discharged through a silencer.

The single solenoid valve (MCVS), (1) figure 3-9, is operated at uncoupling, causing the uncoupling cylinder to move and the tappet valve on the operated car to close. In addition, it keeps the tappet valve on the car that is left, open to be vented. The uncoupling signal should be kept on until the cars are separated by approx. 2 inches.

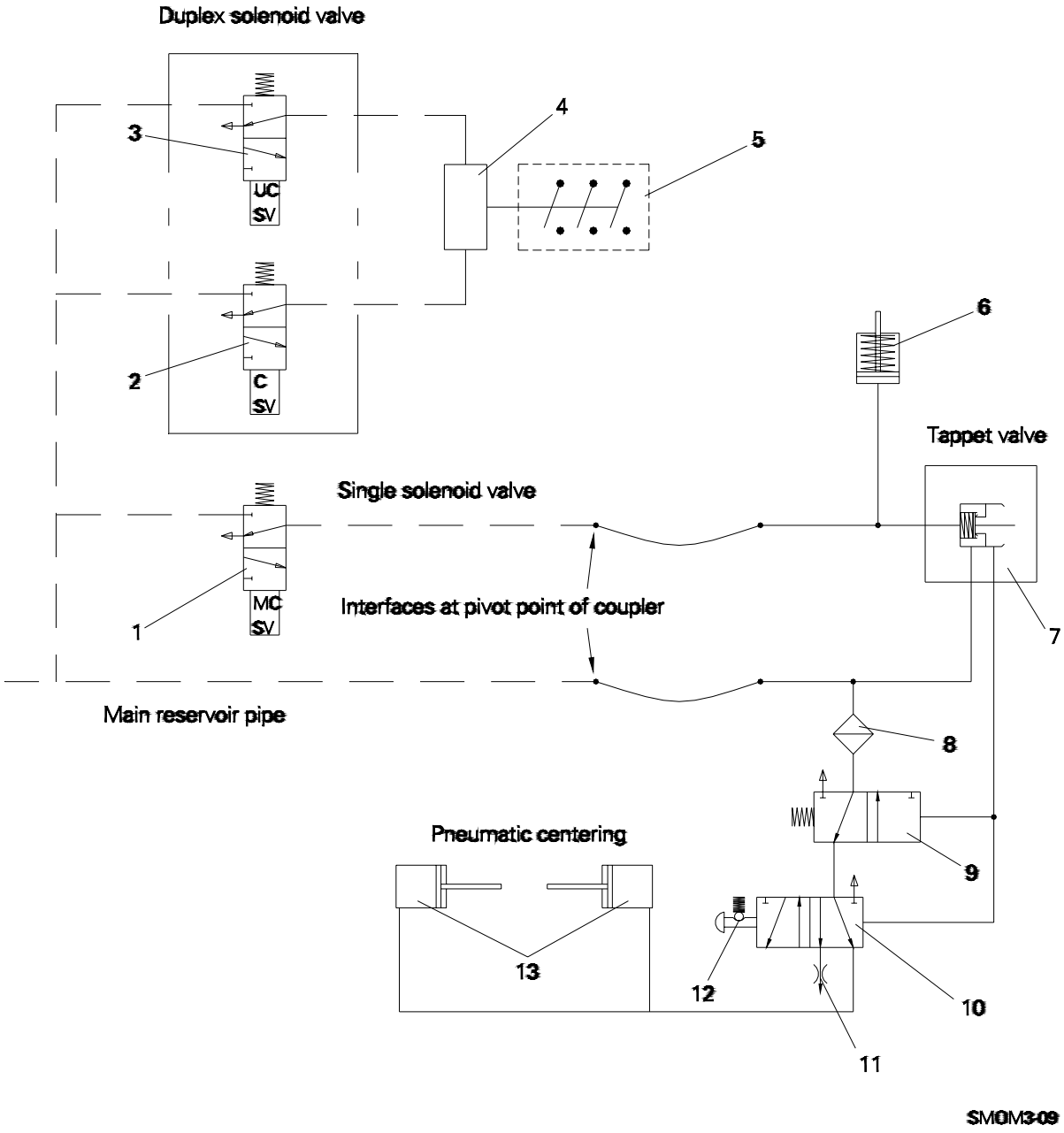

Figure 3-9. Pneumatic diagram

Item	Description	Item	Description
1	Solenoid valve MCSV	8	Filter 3/8"
2	Solenoid valve CSV	9	Valve 3/2
3	Solenoid valve UCSV	10	Valve 5/2
4	Switch actuator	11	Choke
5	Control box	12	Discharge handle
6	Uncoupling cylinder	13	Centring cylinder
7	Tappet valve in the pneumatic coupler		

Table 3-8. Items in figure 3-9

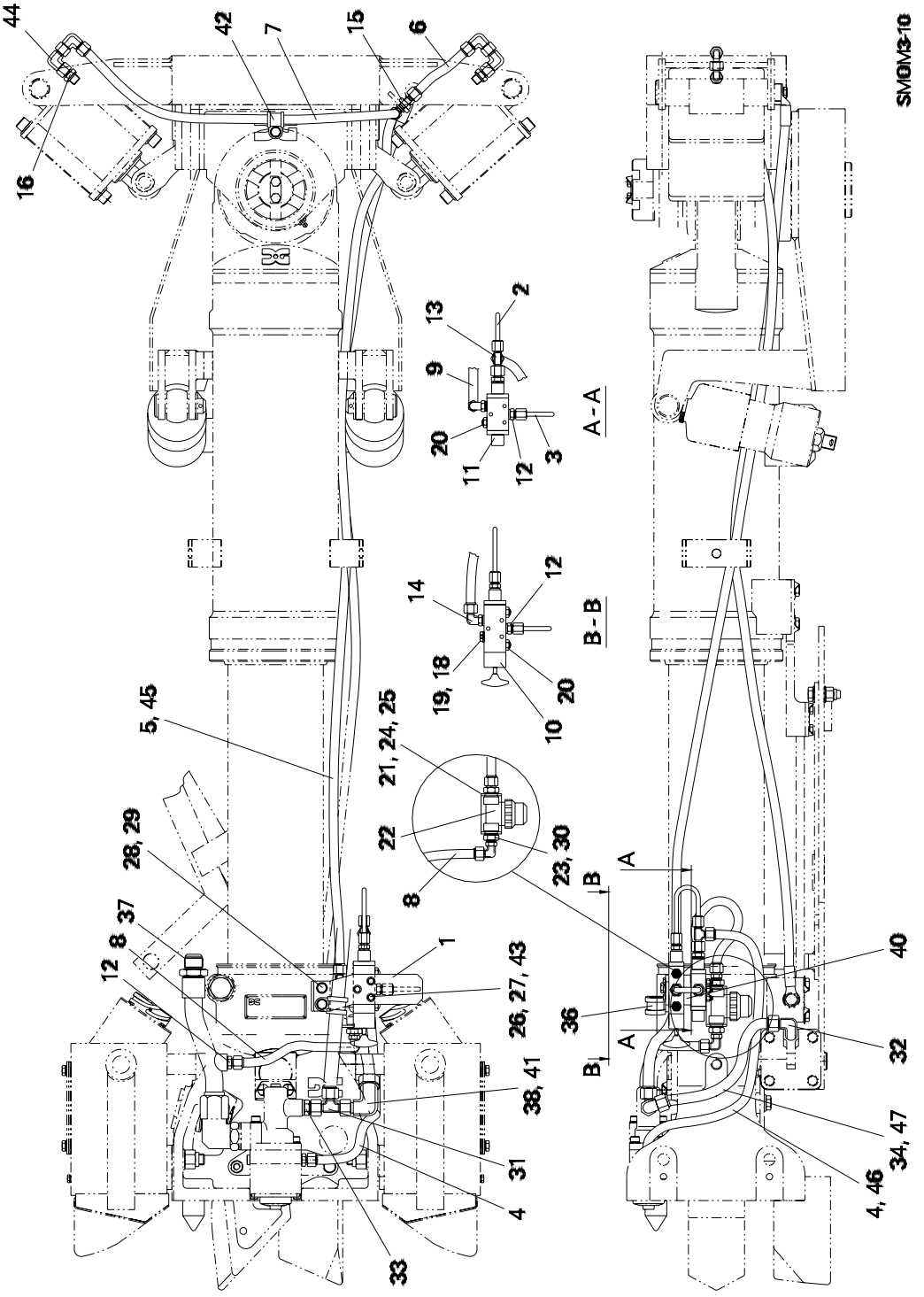

Figure 3-10. Pneumatic system

Item	Description	Item	Description	Item	Description
1	Plate	17	-	33	Adaptor
2	Tube	18	Choke	34	Hose
3	Tube	19	Tredo washer	35	-
4	Hose	20	Silencer	36	Cable clamp
5	Hose	21	Filter attachment	37	Adaptor
6	Hose	22	Filter	38	Reducing
7	Hose	23	Washer	39	-
8	Hose	24	Washer	40	Plate
9	Hose	25	Screw	41	Adaptor
10	Valve	26	Screw	42	Clamp
11	Valve	27	Nut	43	Washer
12	Adaptor	28	Screw	44	Adaptor
13	Adaptor	29	Washer	45	Protective spiral
14	Adaptor	30	Adaptor	46	Protective spiral
15	Adaptor	31	Adaptor	47	Protective spiral
16	Adaptor	32	Adaptor		

Table 3-9. Items in figure 3-10

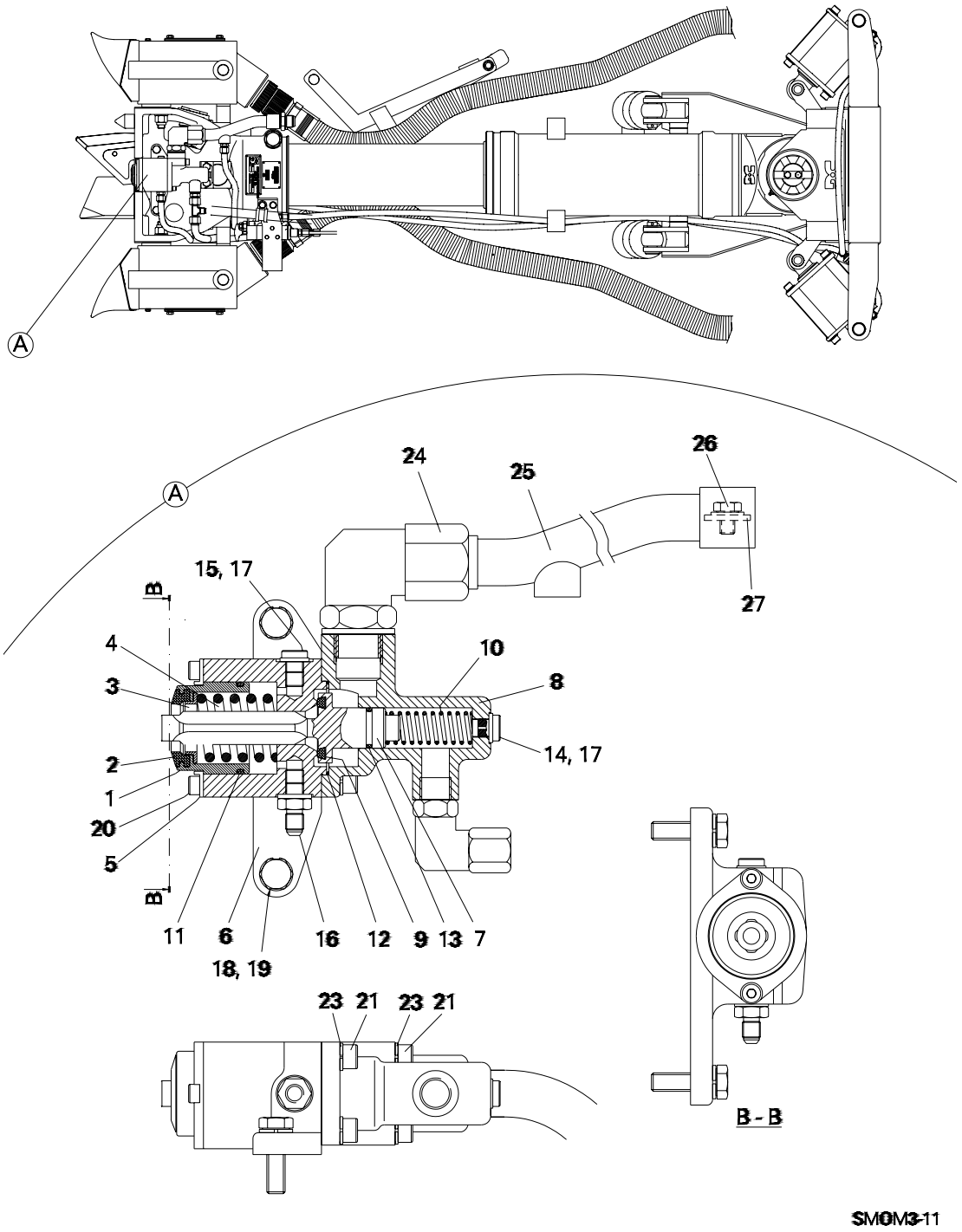

Figure 3-11. Pneumatic coupler

Item	Description	Item	Description	Item	Description
1	Seal holder	10	Spring	19	Washer
2	Seal	11	O-ring	20	Screw
3	Lock ring	12	O-ring	21	Screw
4	Spring	13	O-ring	22	Screw
5	Securing washer	14	Choke	23	Washer
6	Valve bracket	15	Hexagon plug	24	Adaptor 90°
7	Valve rod	16	Adaptor	25	Tube, compl.
8	Valve housing	17	Tredo washer	26	Screw
9	Seal	18	Screw	27	Washer

Table 3-10. Items in figure 3-11

3.2.1.6 Electrical Coupler Heads

The electrical coupler heads, figure 3-12, provide electrical train line coupling. The electrical coupler heads are side mounted. There is an electrical coupler head on each side of the coupler head. The electrical coupler heads are designated right and left electrical coupler head (when viewing the coupler heads from inside the car).

The face of each electrical coupler head has 56 butt-type contacts, see figure 3-13. Each contact is individually spring loaded and is silver faced in order to provide low electrical resistance and to minimise the effects of oxidation. The contacts are mounted in a fixed insulation block, (1) figure 3-13, designed to resist the effects of car wash detergents. A rubber gasket, (3) figure 3-12, round the electrical head forms a tight seal between coupled parts. When the coupler is in uncoupled state, the contacts are protected by a metal cover (7).

Behind the insulating block, inside each electrical coupler head, cables, (9) figure 3-13, are connected to the backsides of the butt-type contacts by lug terminals which are retained with washers (5), lock nuts (7) and nylon nuts (8). The cables are connected to a multi-pin receptacle (2) on the backside of the electrical coupler head. The multi-pin receptacle is used for interconnection with the vehicle cable.

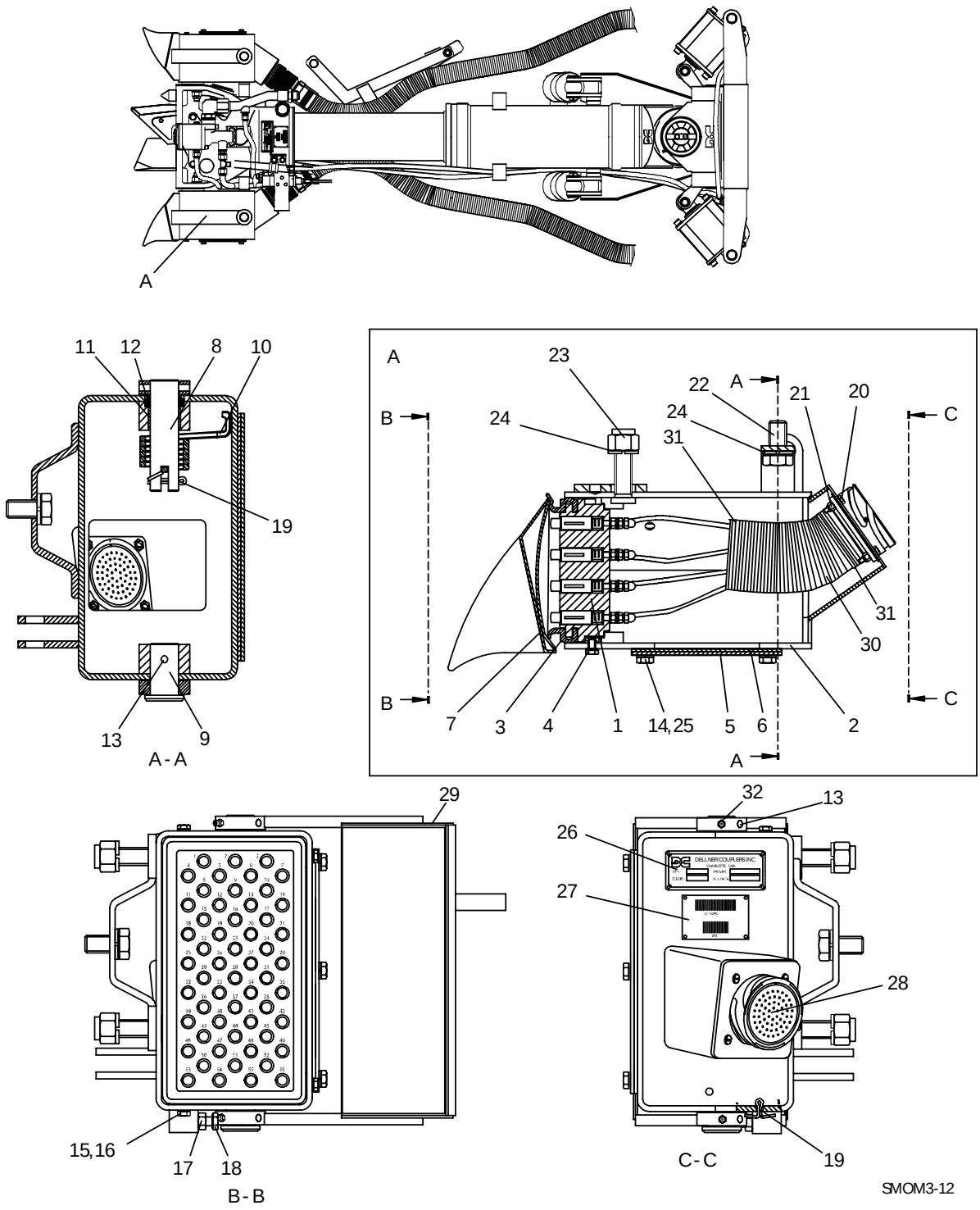

Figure 3-12. Electrical coupler (left)

Item	Description	Item	Description	Item	Description
1	Contact device	12	Wiper	23	Nut
2	Contact housing	13	Roll pin	24	Washer
3	Front seal	14	Screw	25	Washer
4	Locking plate	15	Screw	26	Type plate
5	Side cover	16	Washer	27	Bar code sign
6	Side seal	17	Nut	28	Receptacle
7	Cover	18	Screw	29	Plug
8	Pin	19	Split pin	30	Protecting hose
9	Pin	20	Screw	31	Cable strap
10	Spring	21	Nut	32	Grease fitting
11	Bearing	22	Screw	33	Split pin

Table 3-11. Items in figure 3-12

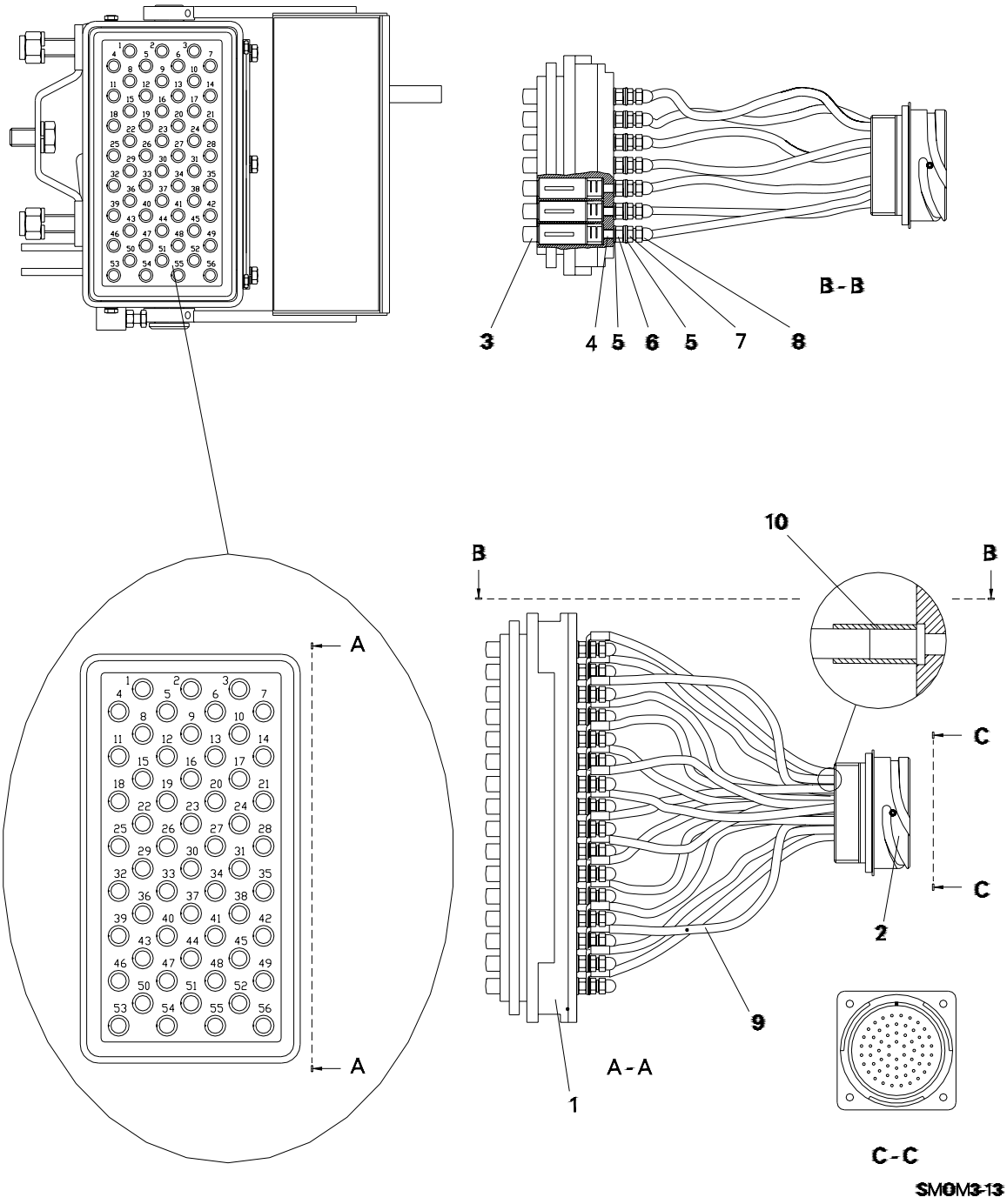

Figure 3-13. Contact device (left)

Item	Description	Item	Description
1	Contact block, left	6	Nut
2	Receptacle	7	Lock nut
3	Spring contact	8	Nylon nut
4	Screw	9	Cable kit, left
5	Washer	10	Shrink tube

Table 3-12. Items in figure 3-13

3.2.1.7 Control Box

The control box includes a two position switch, (11) figure 3-16, and a pneumatic actuator for make and brake of the train line circuits. The switch includes twelve NC and 60 NO contacts.

The control box also includes four quick-disconnect receptacles (14, 15, 16, 17) for the incoming electrical coupler cables and for connection of the car wiring. The receptacles are hard-wired to each side of the switch. The mating plugs for the car wiring are included.

The control box is operated by an air pressure signal from the coupler control system. The housing contains the switch contacts

In the event of pneumatic system failure, the control box is manually operated by the manual handle.

The covers can easily be removed by the1/4-turn screws. The wiring will then be accessible for inspection and maintenance.

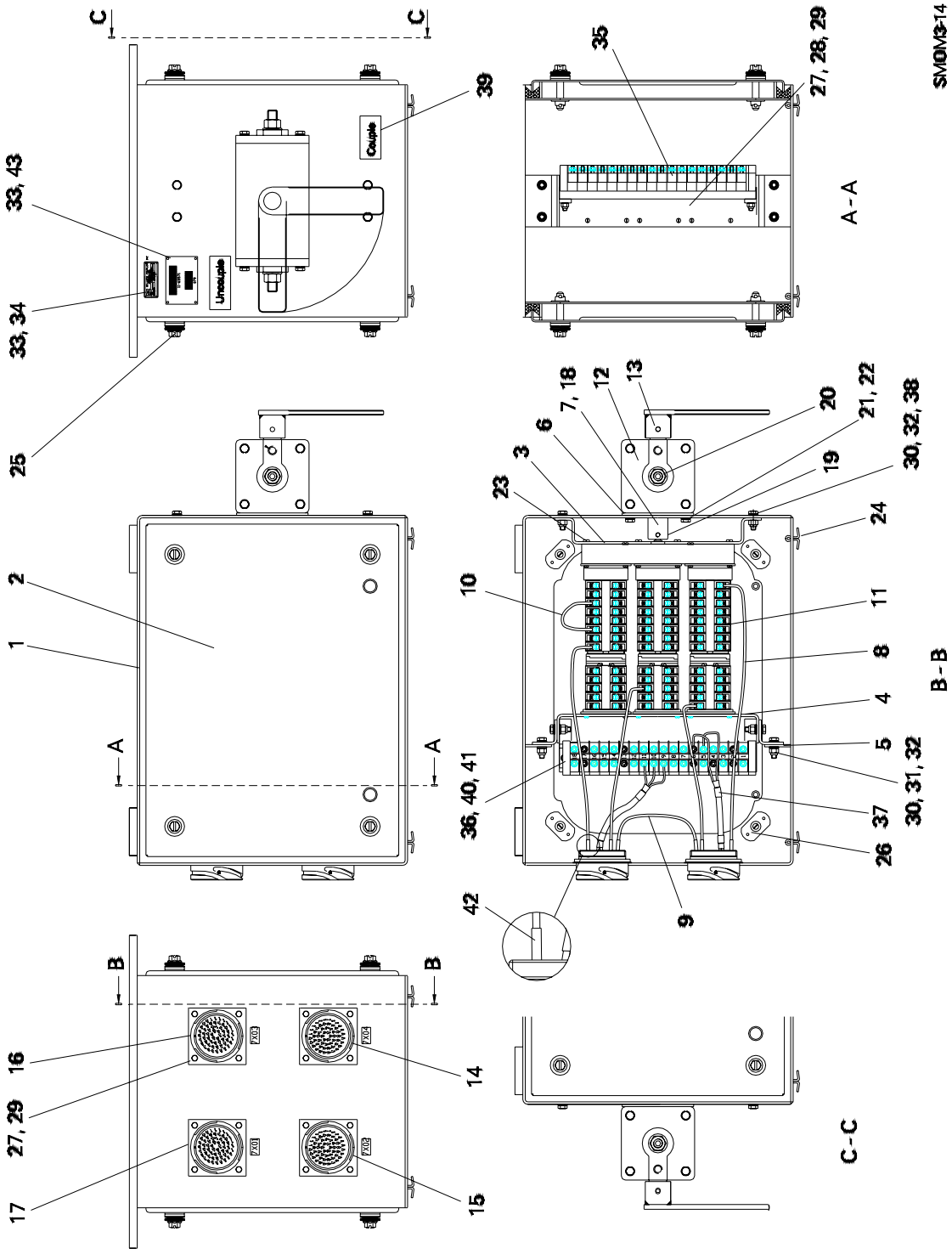

Figure 3-14. Control box

Item	Description	Item	Description	Item	Description
1	Box	16	Receptacle, 80°	31	Washer
2	Cover	17	Receptacle, 80°	32	Screw
3	Bracket plate	18	Key	33	Rivet
4	Bracket plate	19	Stop screw	34	Type plate
5	Bracket plate	20	Cotter pin	35	Terminal
6	Seal	21	Screw	36	Screw
7	Shaft	22	Washer	37	Cable kit
8	Cable kit	23	Screw	38	Washer Tredo
9	Cable kit	24	Split pin	39	Sticker set
10	Cable kit	25	¼-screw, complete	40	Nut
11	Switch C10	26	Rivet	41	Washer
12	Rotary actuator	27	Screw	42	Shrink tube
13	Manual handle	28	Washer	43	Bar code sign
14	Receptacle, 0°	29	Nut		
15	Receptacle, 0°	30	Nut		

Table 3-13. Items in figure 3-16

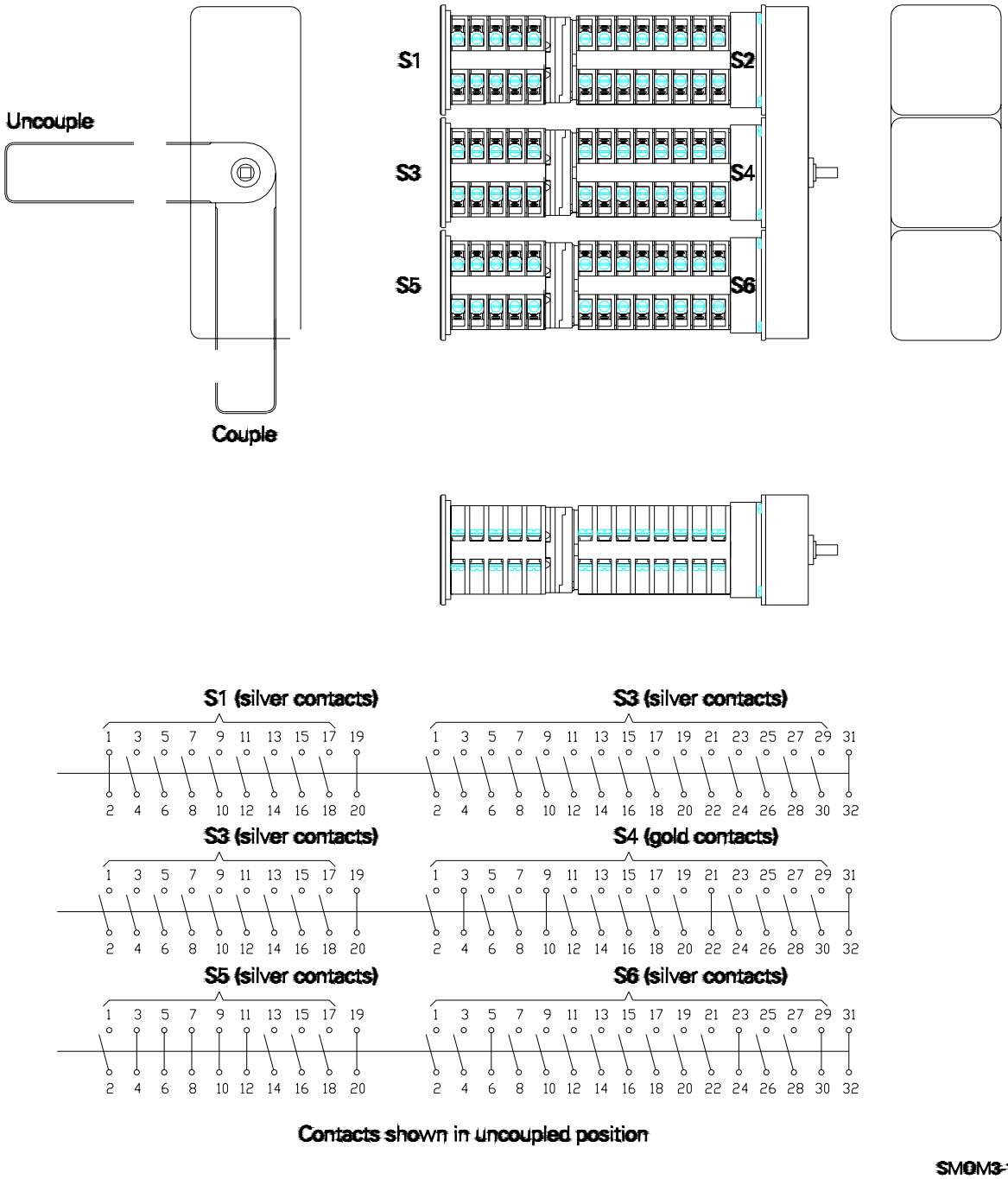

Figure 3-15. Switch C10

3.2.2 Specific Safety Precautions

3.2.2.1 Warning – Rail vehicle may move

WARNING: PRIOR TO PERFORMING ANY TEST OR WORK ON EQUIPMENT ENSURE VEHICLE IS SECURED FROM MOVEMENT (HANDBRAKE APPLIED, WHEELS CHOCKED).

3.2.2.2 Warning – Electrically energised equipment

WARNING: EXERCISE EXTREME CARE WHEN WORKING WITH OR IN CLOSE PROXIMITY TO ELECTRICALLY ENERGISED EQUIPMENT.

3.2.2.3 Warning – Heavy equipment

WARNING: MAKE SURE THE BUFFER IS SUPPORTED ONLY IN SOLID AREAS, IT IS VERY HEAVY (1075 POUNDS). IMPROPER SUPPORT OF THE BUFFER COULD RESULT IN BODILY INJURY IF THE BUFFER SHOULD MOVE OR FALL ACCIDENTALLY.

3.2.2.4 Warning – Compressed ring springs

WARNING: EXTREME CAUTION IS TO BE EXERCISED WHEN DECOMPRESSING RING SPRING. WHEN JAMMED RINGS SEPARATE THEY DO IT IN HIGH SPEED AND FORCE WHICH COULD CAUSE PERSONNEL INJURIES. INSTRUCTIONS GIVEN IN THIS INSTRUCTION HAVE TO BE FOLLOWED CAREFULLY TO AVIOD ACCIDENTS.

3.2.2.5 Warning – Heavy equipment

WARNING: THE COUPLER WEIGHS 1075 POUNDS. A PROPER LIFTING DEVICE, SUCH AS A HYDRAULIC LIFT TABLE, FITTED WITH WOODEN BLOCKS TO ACCEPT THE CONTOURS OF THE COUPLER MUST BE USED DURING THESE MAINTENANCE PROCEDURES TO ENSURE THE SAFETY OF PERSONNEL.

3.2.2.6 Warning – Solvents

WARNING: THE USE OF SOLVENTS AS CLEANING AGENTS COULD INVOLVE HEALTH AND/OR SAFETY HAZARDS. USE ONLY WITHIN THE GUIDELINES SET FORTH BY THE AUTHORITY.

3.2.2.7 Caution – Electrical equipment

CAUTION: **DO NOT** SPREAD LIQUID SOLVENTS OR DETERGENTS ON TO THE ELECTRICAL COUPLER INSULATION BLOCK.

CAUTION: **DO NOT** STEAM CLEAN AS PRESSURE MAY FORCE MOISTURE INTO ELECTRICAL APPARATUS.

3.2.3 Fault Isolation

The Troubleshooting Table lists possible mechanical, electrical and pneumatic problems, probable cause and corrective action. Not all symptoms and possible causes are listed, only the most probable.

WARNING: Rail vehicle may move
Follow the safety precautions in section 3.2.2.1.

WARNING: Electrically energised equipment
Follow the safety precautions in section 3.2.2.2.

3.2.3.1 Mechanical Coupler

SYMPTOM	PROBABLE CAUSE	CORRECTIVE ACTION
1. Will not gather.	a. Coupler not within gathering range.	a. Manually align couplers.
	b. Excessive downward tilt of coupler heads.	b. Adjust coupler height. (See the Maintenance Manual)
2. Will not couple.	a. Foreign material in coupling mechanism.	a. Remove foreign material.
	b. Worn guide pin/bushing.	b. Typical pin diameter wear is 0.063 in. Typical bushing diameter wear is 0.031 in. Replace as required.
	c. Hook(s) jammed.	c. Remove road dirt from coupler face. Lubricate hook pin, cam pin (see the Maintenance Manual). Remove rust and burrs from cam pin.
	d. Uncoupling cylinder pressurized.	d. Check for airline obstruction/operation of solenoid valve MCSM.
	e. Hook worn.	e. Gage (see the Maintenance Manual) and replace if required.
	f. Coupler head throat opening worn.	f. Gage (see the Maintenance Manual) and replace if required.
	g. Weak or broken hook spring(s).	g. Replace if required.

SYMPTOM	PROBABLE CAUSE	CORRECTIVE ACTION
	h. Internal corrosion of uncoupling cylinder,	h. Repair/replace as required.
	i. Foreign object between contacts preventing circuits.	i. Remove foreign object. Check contacts and block for damage.
3. Will not uncouple.	a. Uncoupling cylinder not pressurized.	a. Insufficient air pressure. Obstructed or leaking air line. Solenoid valve inoperative or faulty holding relay.
	b. Couplers under draft (tension) load.	b. Buff (compress) couplers.
	c. Worn/broken cam.	c. Replace cam.
4. Coupler will not centre; hard to move laterally.	a. Pivot pin not lubricated.	a. Lubricate pivot.
5. Coupler is not centred on car.	a. Broken centring device.	a. Replace (see the Maintenance Manual).
	b. Inadequate air supply to centring device.	b. Adjust the air supply.

Table 3-14. Troubleshooting table

3.2.3.2 Electrical Coupler

SYMPTOM	PROBABLE CAUSE	CORRECTIVE ACTION
1. Electrical coupler loss of contact.	a. Bent contact.	a. Replace contact.
	b. Broken connection.	b. Repair wire connection.
	c. Loose connector at junction box.	c. Tighten connector.
	d. Foreign object between contacts preventing circuits.	ed. Remove foreign object. Check contacts and block for damage.
	e. Damaged insulation block preventing contacts from mating.	e. Replace damaged block.
	f. Contact(s) pushed back.	f. Replace contact.
2. Control box will not actuate.	a. No power.	a. Check power supply.
	b. Low air pressure.	b. Check air supply.
	c. Broken actuator.	c. Replace actuator.
3. Actuator will not move.	a. No air pressure.	a. Check air supply.
	b. No power.	b. Check power to solenoid valves CSM and VCSM.
	c. Open circuit.	c. Check circuitry.
4. Vital circuits not made after coupling.	a. Control box not in "couple" position.	a. Check actuator, contact switches, solenoid valve (CSM), power and air supplies.
5. Actuator air leak.	a. Loose fittings.	a. Apply an Authority approved sealant to threads; re-tighten.
	b. Gasket failure.	b. Replace gaskets as required.

Table 3-15. Troubleshooting table

3.2.3.3 Pneumatic System

SYMPTOM	PROBABLE CAUSE	CORRECTIVE ACTION
1. Air leak.	a. Air bushings frozen/corroded.	a. Repair/replace as required.
	b. Broken spring.	b. Replace spring.
	c. Loose pipe joints.	c. Tighten joints.
	d. Gasket failure.	d. Replace gasket.
	e. Worn/deteriorated hoses.	e. Replace hoses.
2. Coupling sequence initiated but before sequence is complete, valve chatters and blows to exhaust.	a. Low air supply.	a. Check air supply and piping.
	b. Liquid in air lines.	b. Drain air lines at rotary switch actuator.
	c. Blocked or leaking air line.	c. Check air supply and piping.
3. Solenoid valve blows to exhaust at all times. (MCSV - uncoupling cylinder) (CSV - switch actuator) (UCSV - switch actuator)	a. Valve seat damaged.	a. Replace valve.
	b. Poppet jammed due to swelling of seals.	b. Replace valve.
	c. Broken or weak spring. (V2 and V2).	c. Replace valve.
	d. Low air supply pressure.	d. Check air supply pressure.
4. Solenoid valves operate sluggishly.	a. Low battery voltage.	a. Check voltage.
	b. Inadequate air supply.	b. Check air supply.
	c. Liquid in air line.	c. Clean air line and check filter or airline manifold.

SYMPTOM	PROBABLE CAUSE	CORRECTIVE ACTION
5. Solenoid valve buzzes excessively.	a. Armature not seating properly.	a. Replace valve.
6. Solenoid valve burns out prematurely.	a. Over voltage.	a. Check operating voltage - maximum 44 VDC.

Table 3-16. Troubleshooting table

3.2.4 Disassembly

General

In order to disassemble the coupler it must first be removed from the car. To remove the coupler from the car, follow the instructions in the Maintenance Manual.

WARNING: Heavy equipment
Follow the safety precautions in section 3.2.2.5.

Some assemblies may be adjusted and tested while the coupler is still attached to the car. These procedures are described in the Maintenance Manual

Perform the complete disassembly of the coupler in the same order as described below.

3.2.4.1 Electrical Coupler Heads

The left and right electrical couplers are each others reflection. Therefore do the following instruction twice, one for each coupler.

Dismounting of electrical coupler head

Numbers in parentheses ( ) refer to figure 3-16.

1. Disconnect the cable assembly (5).
2. Unscrew the two nuts (1 and 2).
3. Unscrew the screw (3).
4. Remove the electrical coupler from the mechanical coupler head.

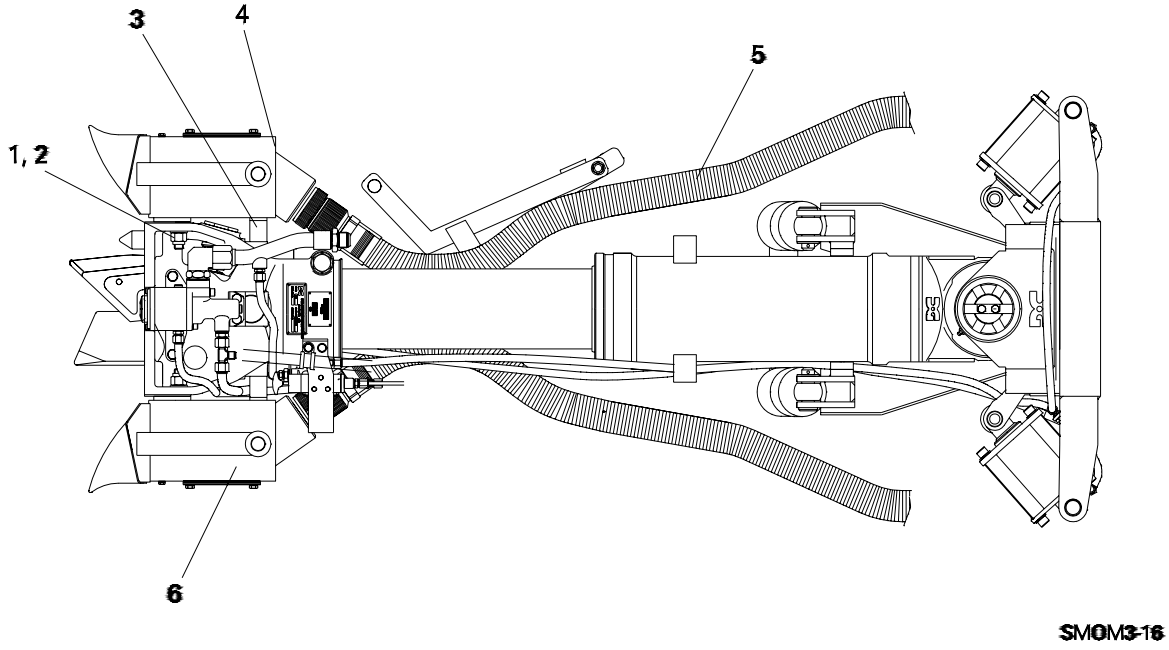

Figure 3-16. Overview

Pos.	Name	Pos.	Name
1	Upper nut	4	Left electrical coupler
2	Lower nut	5	Cable assembly, left
3	Screw	6	Right electrical coupler

Table 3-17. Items in figure 3-16

Disassembly of electrical coupler head

Numbers in parentheses ( ) refer to figure 3-17.

1. Disassemble the electrical coupler by unscrewing the six screws (19) which hold the side cover (20) and the side seal (21).

CAUTION: The spring is pre-loaded.

2. Remove the split pin (13) and release the spring force of the spring (7).
3. Remove the three split pins (5, 6 and 11). Discard the split pins.
4. Remove the pin (12).
5. Push the pin (8) upwards and remove the spring (7).

6. Remove the pin (8), the wiper (9) and the bearing (10). The cover (14) of the electrical coupler is now loose and can be removed.

7. Now loosen the receptacle (25) by unscrewing the four screws (24) and the four nuts (23). Take care not to damage the cables connected to the receptacle inside the contact housing (22).

8. Place a piece of wood over the contact device (17) and apply a screw clamp to press the contact device slightly into the contact housing (22). This releases the pressure on the four screws (1) which hold the insulating block against the front seal (15).

9. Unscrew the four screws (1) and remove the screws and the washers (2).

10. Carefully release the screw clamp. Pull the contact device (17) out of the contact housing (22).

11. Remove the two locking plates (16) and the front seal (15) from the contact device (17).

12. Remove the grease fitting (33).

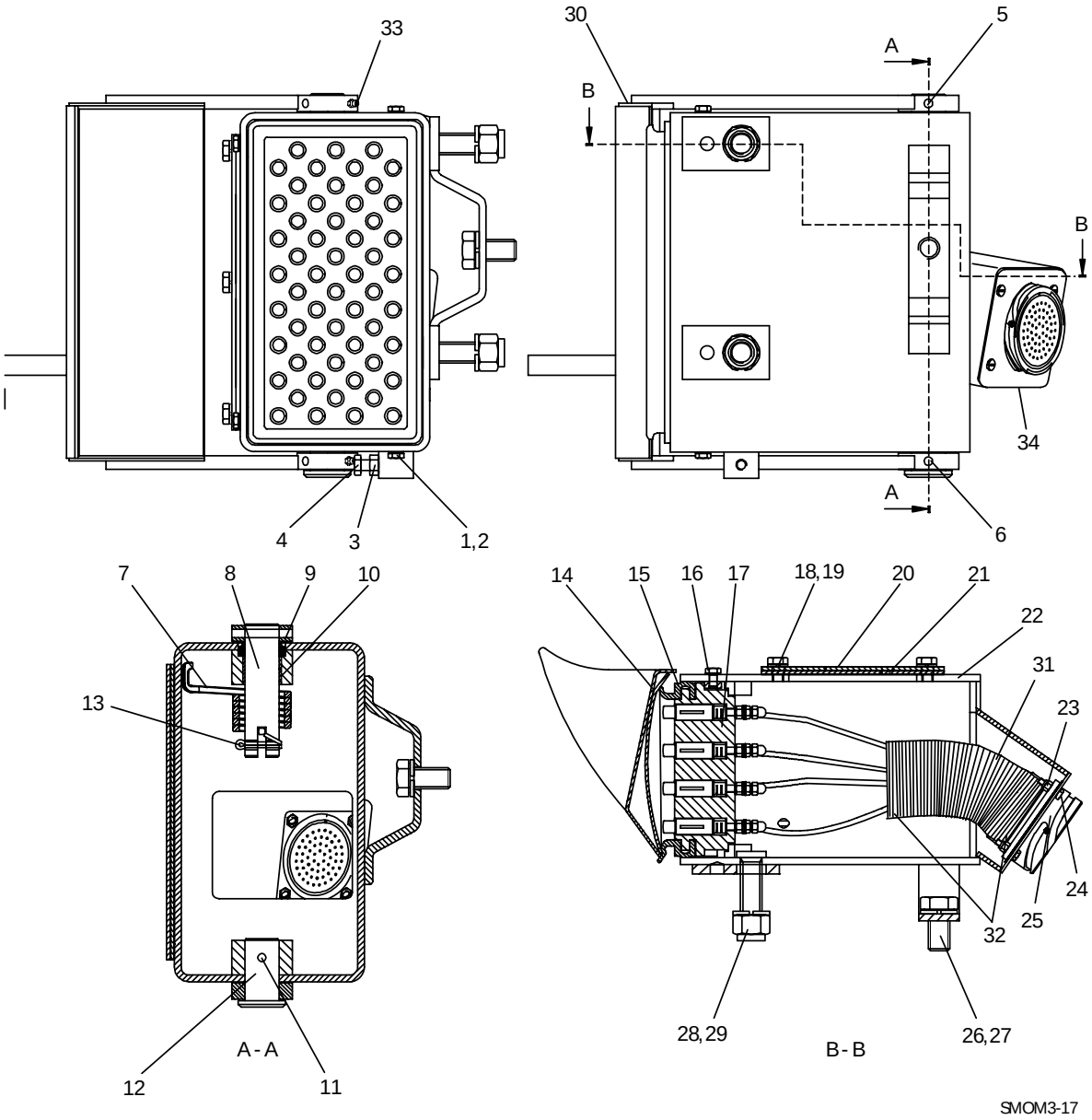

Figure 3-17. Electrical coupler, right

Pos.	Name	Pos.	Name
1	Screw	18	Washer
2	Washer	19	Screw
3	Nut	20	Side cover
4	Screw	21	Side seal
5	Roll pin	22	Contact housing
6	Roll pin	23	Nut
7	Spring	24	Screw
8	Pin	25	Receptacle
9	Wiper	26	Screw
10	Bearing	27	Washer
11	Roll pin	28	Nut
12	Pin	29	Washer
13	Split pin	30	Plug
14	Cover	31	Protecting hose
15	Front seal	32	Cable strap
16	Locking plate	33	Grease fitting
17	Contact device	34	Split pin

Table 3-18. Items in figure 3-17

3.2.4.2 Pneumatic System

Dismounting of pneumatic system

Numbers in parentheses ( ) refer to figure 3-18.

1. Unscrew and remove the five hoses (4, 6, 7, 8 and 34).
2. Unscrew the two screws (28) which hold the plate (1) on which the valves (10 and 11) are mounted.
3. Unscrew the two screws (25) and remove the filter (22).
4. It is now possible to unscrew and remove the hoses (5 and 9) behind the plate (1).
5. Unscrew and remove the two adaptors (31 and 41).
6. Unscrew the two screws which hold the pneumatic coupler. Remove the pneumatic coupler.

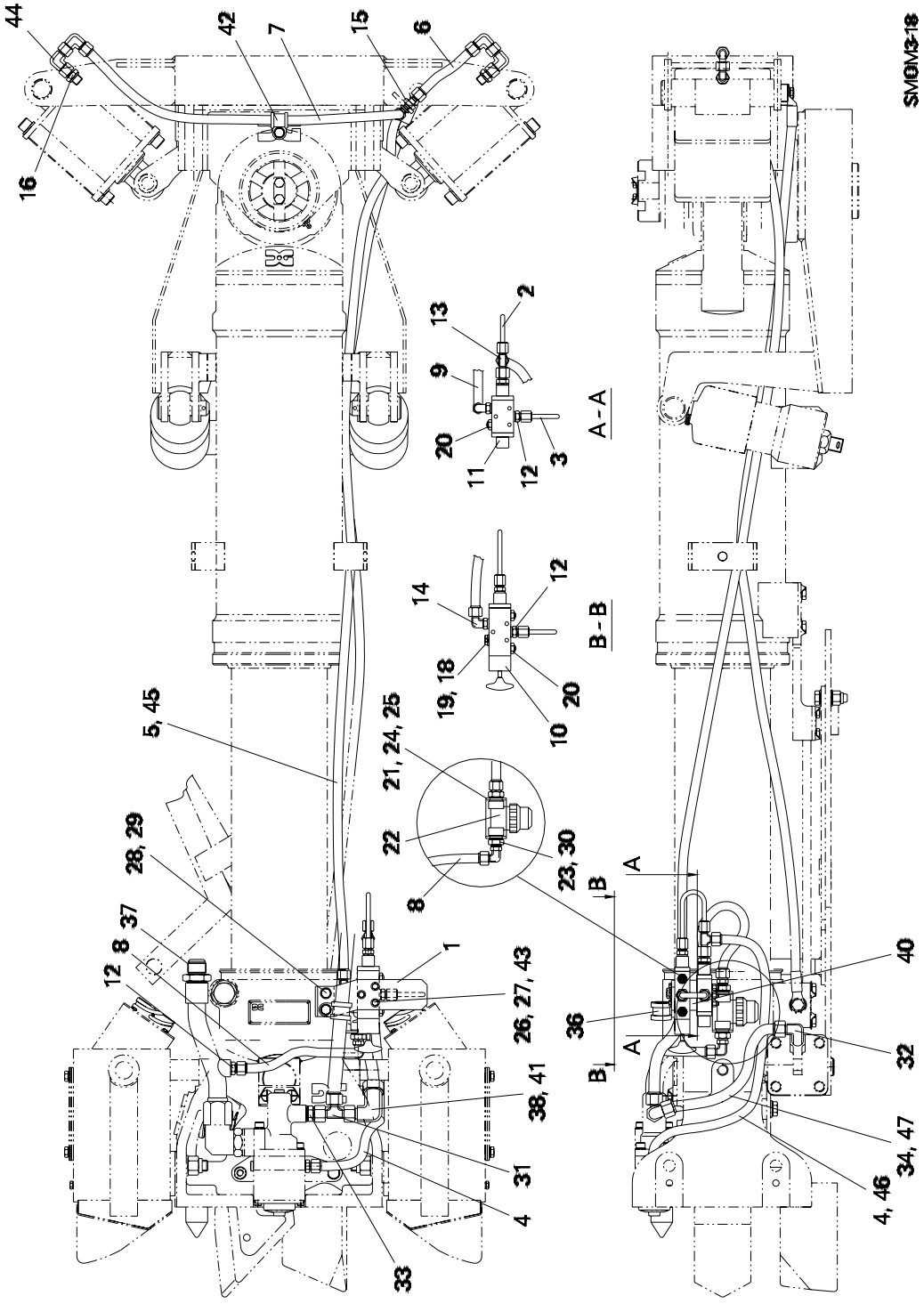

Figure 3-18. Pneumatic system

Item	Description	Item	Description	Item	Description
1	Plate	17	-	33	Adaptor
2	Tube	18	Choke	34	Hose
3	Tube	19	Tredo washer	35	-
4	Hose	20	Silencer	36	Cable clamp
5	Hose	21	Filter attachment	37	Adaptor
6	Hose	22	Filter	38	Reducing
7	Hose	23	Washer	39	-
8	Hose	24	Washer	40	Plate
9	Hose	25	Screw	41	Adaptor
10	Valve	26	Screw	42	Clamp
11	Valve	27	Nut	43	Washer
12	Adaptor	28	Screw	44	Adaptor
13	Adaptor	29	Washer	45	Protective spiral
14	Adaptor	30	Adaptor	46	Protective spiral
15	Adaptor	31	Adaptor	47	Protective spiral
16	Adaptor	32	Adaptor		

Table 3-19. Items in figure 3-18

Disassembly of pneumatic coupler

Numbers in parentheses ( ) refer to figure 3-19.

1. Unscrew and remove the tube (16) and the adaptor (15).
2. Unscrew the two screws (6) and remove the securing washer (5), the seal holder (7), the lock-ring (9) and the spring (10).
3. Unscrew the two screws (3) and the two screws (1) and remove the valve bracket (30), the valve rod (23), the spring (19) and the O-ring (26) from the valve housing (20).

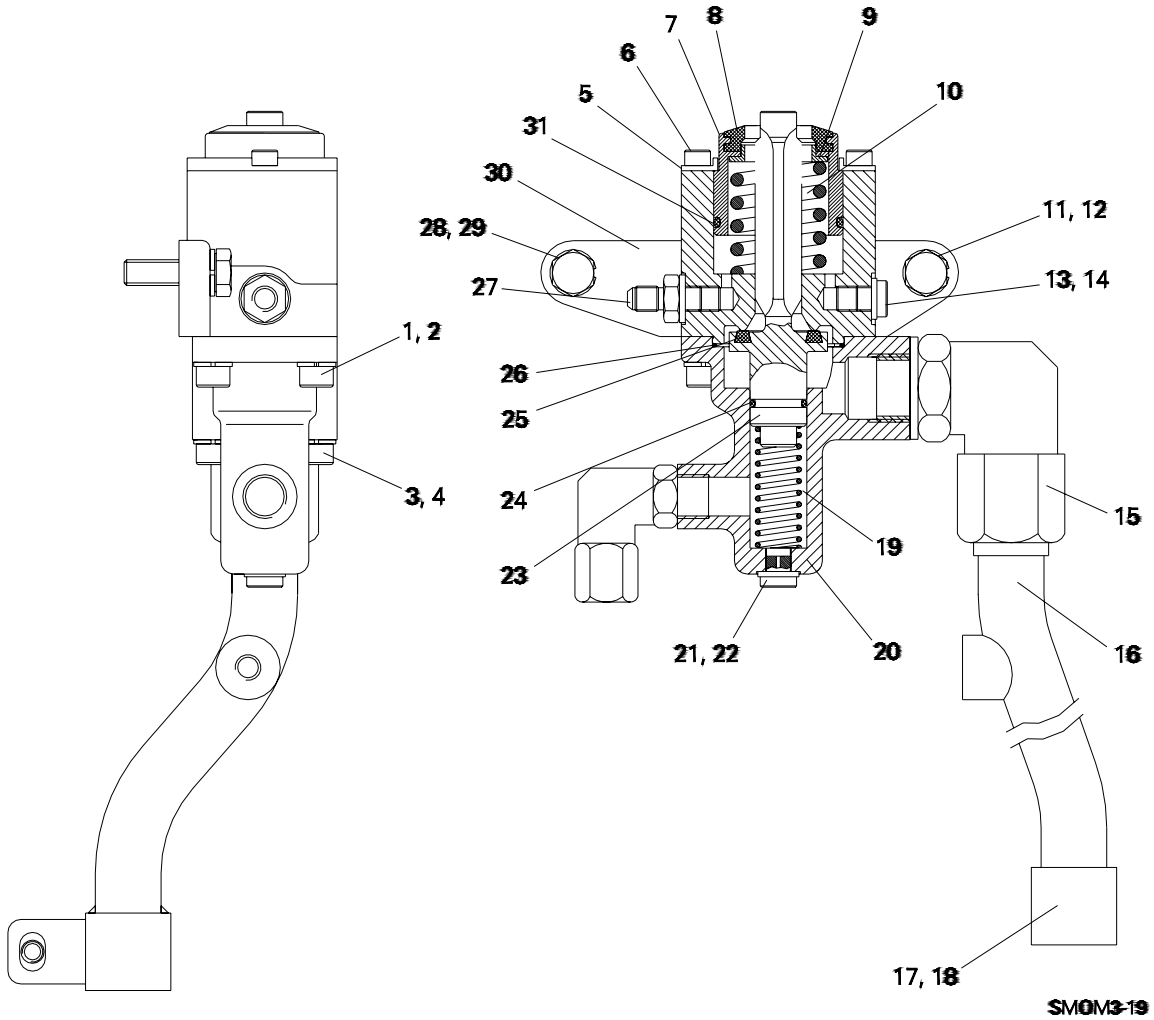

Figure 3-19. Pneumatic coupler

Pos.	Name	Pos.	Name
1	Screw	17	Washer
2	Washer	18	Screw
3	Screw	19	Spring
4	Washer	20	Valve housing
5	Securing washer	21	Tredo washer
6	Screw	22	Choke
7	Seal holder	23	Valve rod
8	Seal	24	O-ring
9	Lock ring	25	Seal
10	Spring	26	O-ring
11	Screw	27	Adaptor
12	Washer	28	Washer
13	Hexagon plug	29	Screw
14	Tredo washer	30	Valve bracket
15	Adaptor 90°	31	O-ring
16	Tube		

Table 3-20. Items in figure 3-19

3.2.4.3 Mechanical Coupler

Dismounting of mechanical coupler head

Numbers in parentheses ( ) refer to figure 3-20.

1. Unscrew the two screws (54) in each end of the ground cable (52), and remove the cable.
2. Unscrew the four screws (57) and remove the guide bar (53).
3. Unscrew the four screws (47) and remove the guide rail (48).
4. Mount attachment (1030172) in the holes for guide rail mounting.
5. Fit buffer clamp (1003706) to hydraulic buffer.
6. Unscrew the nut (3) and remove the screw (4).
7. Insert a bar or similar into the holes of the attachment and the buffer clamp. Remove the mechanical coupler head (20) by unscrewing it from the draft gear (5) with attachment bar while holding the hydraulic buffer in position.

8. Unscrew and remove attachment and buffer clamp.

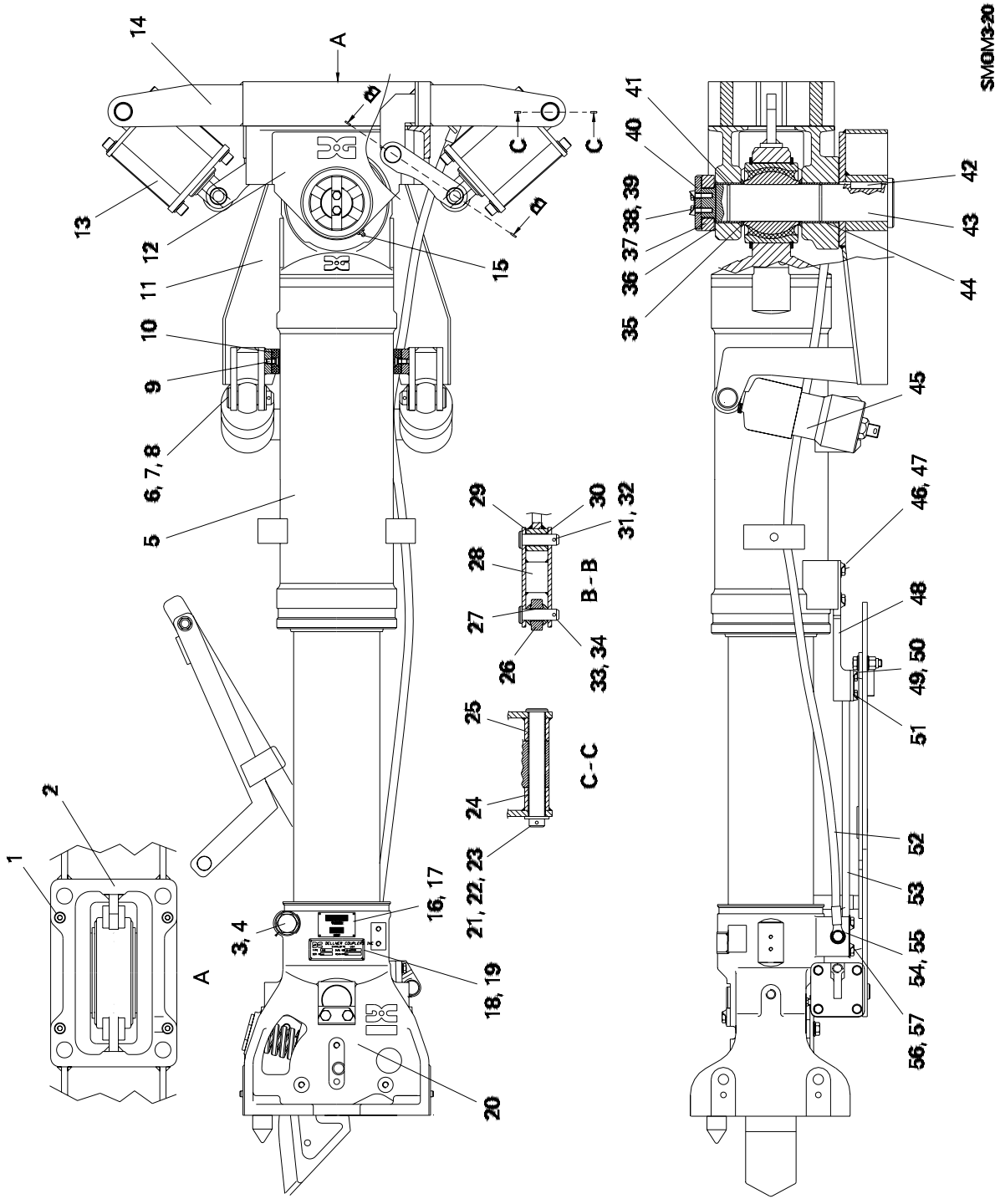

Figure 3-20. Coupler

Pos.	Name	Pos.	Name
1	Screw	30	Bearing
2	Slotted pin	31	Split pin
3	Nut	32	Pin
4	Screw	33	Split pin
5	Buffer	34	Washer
6	Cylinder pin	35	Thrust washer
7	Split pin	36	Washer
8	Washer	37	Nut
9	Screw	38	Screw
10	Bearing	39	Securing plate
11	Support plate	40	Key
12	Bearing bracket	41	Bearing
13	Centring cylinder	42	Key
14	Centring suspension	43	Pin
15	Grease fitting	44	Bearing
16	Rivet	45	Support spring
17	Split pin	46	Securing plate
18	Type plate	47	Screw
19	Rivet	48	Guide rail
20	Mechanical coupler head	49	Securing plate
21	Washer	50	Screw
22	Split pin	51	Cover
23	Pin	52	Ground cable
24	Bearing	53	Guide bar
25	Bearing	54	Screw
26	Roller	55	Washer
27	Bearing	56	Securing plate
28	Link	57	Screw
29	Bearing		

Table 3-21. Items in figure 3-20

Disassembly of mechanical coupler

Numbers in parentheses ( ) refer to figure 3-21.

1. Remove the split pin (25) and the cylinder bolt (23).

2. Remove screw (30), nut (28), washer (31) and bushing (29). Now remove the fold arm (27) from the uncoupling arm (8).

3. Remove the split pin (26). Unscrew the screw (21) and remove the screw and the washer (22). Now remove the uncoupling arm (8) from the uncoupling shaft (7).

4. Remove the split pin (25) and the cylinder bolt (24). The uncoupling cylinder (9) can now be removed.

5. Press the hook (2) towards the right side of the coupler in order to release the uncoupling cam (6) from the pressure from the coil spring (10). A screw clamp or hydraulic press must be used to press the hook to the right.

6. Knock the uncoupling shaft (7) out upwards. Remove the uncoupling shaft (7) and the uncoupling cam (6).

7. Carefully release the screw clamp (or hydraulic press) that holds the hook. As the uncoupling shaft and uncoupling cam have been removed the hook can now be turned to the left side of the coupler head. Withdraw the coil spring (10) from the spring support (11).

8. Unscrew the screw (16) and remove it together with securing washer (4) and the securing plate (5).

9. The main pin (3) is now loose and can be removed by pushing it out of the coupler head. When the main pin is pushed out, the hook (2) will come loose.

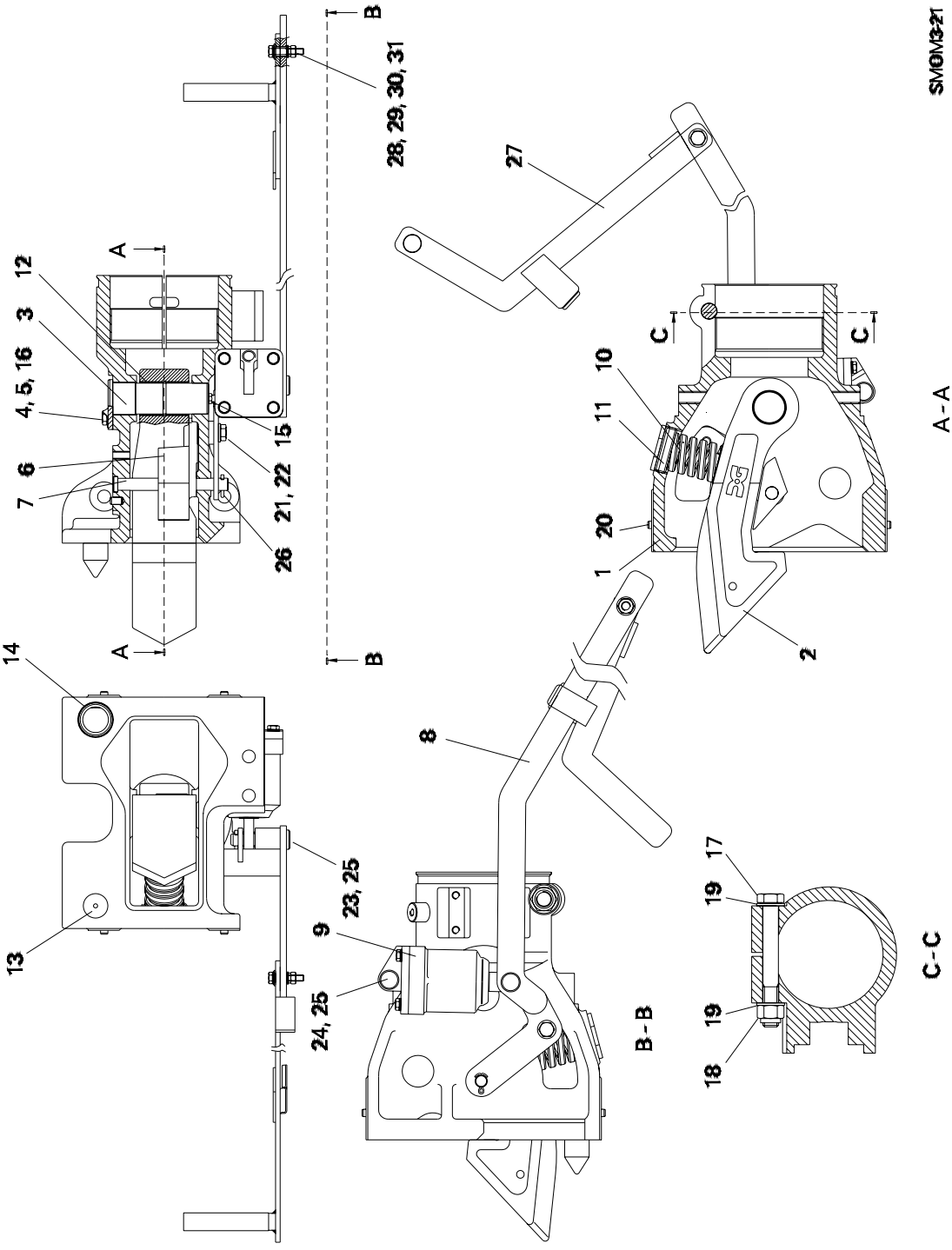

Figure 3-21. Mechanical coupler

Item	Description	Item	Description
1	Coupler head housing	17	Screw (clamp bolt)
2	Hook	18	Nut
3	Main pin	19	Washer
4	Securing washer	20	Cylinder pin
5	Securing plate	21	Screw
6	Uncoupling cam	22	Washer
7	Uncoupling shaft	23	Cylinder bolt
8	Uncoupling arm	24	Cylinder bolt
9	Uncoupling cylinder	25	Split pin
10	Coil spring	26	Split pin
11	Spring support	27	Fold arm
12	Bearing	28	Nut
13	Guide pin	29	Bushing
14	Guide bushing	30	Screw U6S
15	Grease fitting	31	Washer RB
16	Screw		

Table 3-22. Items in figure 3-21

3.2.4.4 Draft Gear and Buffer

Dismounting of draft gear and buffer

WARNING: Heavy equipment
Follow the safety precautions in section 3.2.2.3.

Numbers in parentheses ( ) refer to figure 3-20.

1. Flatten the corners of the securing plate (39), unscrew the two screws (38) and remove the key (40).
2. Unscrew the nut (37) and remove the washer (36).
3. Push out the pin (43) together with the key (42).
4. Remove the buffer (5) together with the thrust washer (35).

Disassembly of draft gear

WARNING: Heavy equipment
Follow the safety precautions in section 3.2.2.3.

WARNING: Compressed ring springs
Follow the safety precautions in section 3.2.2.4.

Numbers in parentheses ( ) refer to figure 3-22.

1. Unscrew the screw (5) on the buffer tube (12).
2. Place the buffer in a vertical press and compress the buffer approximately 2-3 mm.
3. Unscrew and remove the nut (4). Use special tool 153702, socket ring wrench. Slowly release pressure on the buffer and remove it from the press.
4. Pull out the hydraulic buffer (1) from the tube (12).
5. Remove the bearing (3) and the stripper (2) from the nut (4).
6. Remove the bearing (11).
7. Unscrew and remove the stop screw (10).
8. Place the buffer in a vertical press and compress the ring spring assembly. Use special tools 169099, compression ring, and 1002712, clamp.
9. Carefully loosen the nut (9) until two or three treads remains. Use special tool 168820, wrench.
10. Slowly release the pressure on the buffer. Carefully knock on the rings of the ring assembly (7) too loosen them from each other.
11. When all rings are loose, remove the assembly from the press.
12. Remove the nut (9), the ring (8), all ring springs (7) and finally the last ring (6).

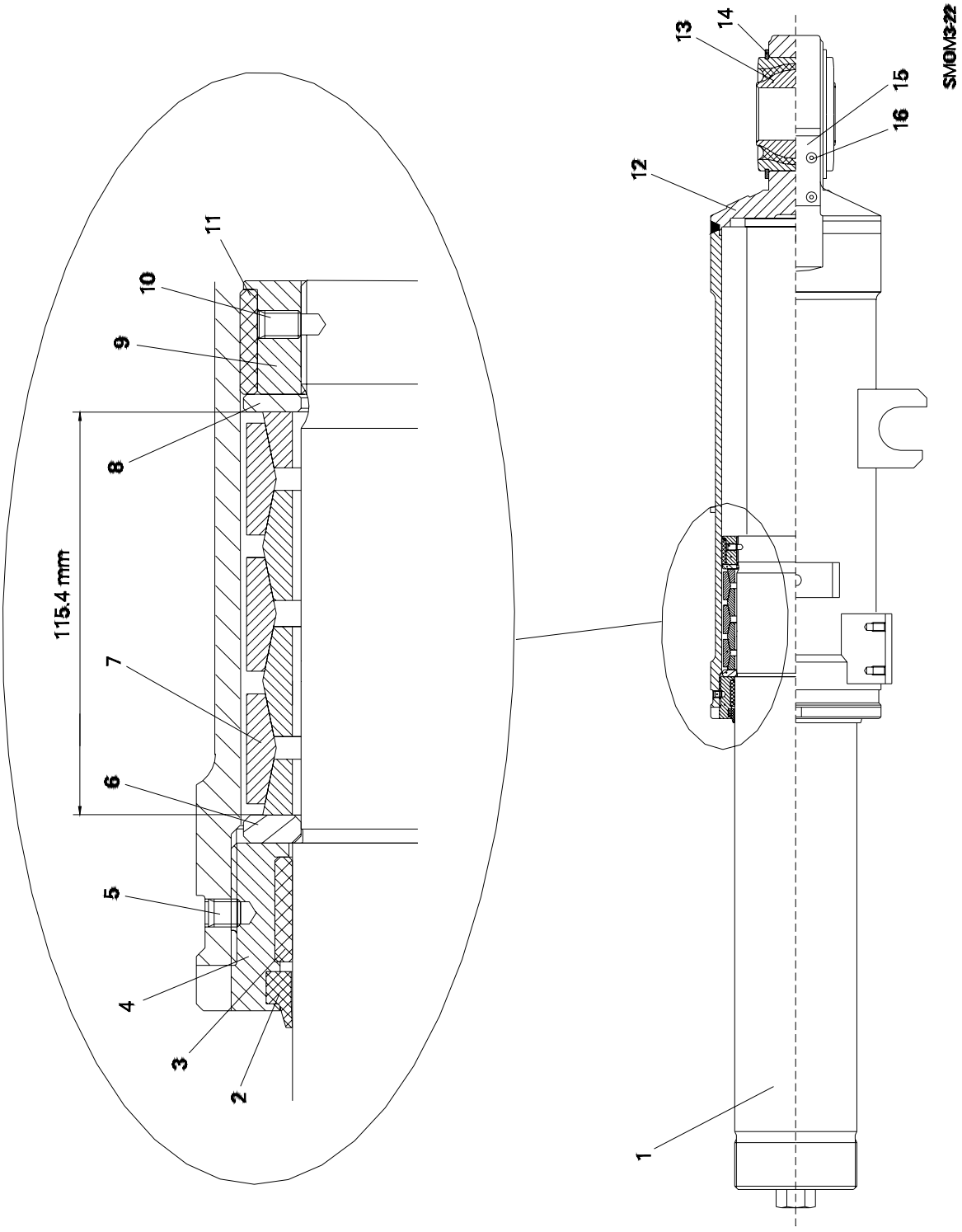

Figure 3-22. Draft gear and buffer

Pos.	Name	Pos.	Name
1	Hydraulic buffer	9	Nut
2	Stripper	10	Stop screw
3	Bearing	11	Bearing
4	Nut	12	Buffer tube
5	Stop screw	13	Spherical rubber bearing
6	Ring	14	Retaining ring
7	Ring spring	15	Wear plate
8	Ring	16	Screw

Table 3-23. Items in figure 3-22

3.2.4.5 Vertical Support and Height Adjustment

Dismounting of vertical support and height adjustment

Numbers in parentheses ( ) refer to figure 3-20.

1. The support plate (11) will come loose when the draft gear and buffer is dismounted, see item 3.2.4.4 Draft Gear and Buffer.

Disassembly of vertical support and height adjustment

Numbers in parentheses ( ) refer to figure 3-20.

1. Unscrew the two screws (9) and remove the bearing (10). Remove the other bearing on the other support plate arm (11) in the same way.

2. Remove the two split pins (7), one each support spring (45).

3. Remove the two washers (8) and pull out the two cylinder pins (6), one on each support spring (45).

4. Remove the support spring (45).

Disassembly of support spring

The vertical support and height adjustment consists of two disc spring units which are identical. Therefore do the following instructions twice, once for each cylinder.

Numbers in parentheses ( ) refer to figure 3-23.

1. Remove the split pin (2).
2. Unscrew the nut (3).
3. Pull up the draft bar (10) together with the protective housing (7).
4. Compress the disk springs, approx. 2–3 mm by pressing on the guide sleeve (1).
5. Remove the clamp ring (4).

CAUTION: The disk springs (6) are pre-loaded with 9.5 kN.

5. Remove the guide sleeve (1) and all the disk springs (6).
6. Repeat step 1 to 9 above for the other disc spring unit.

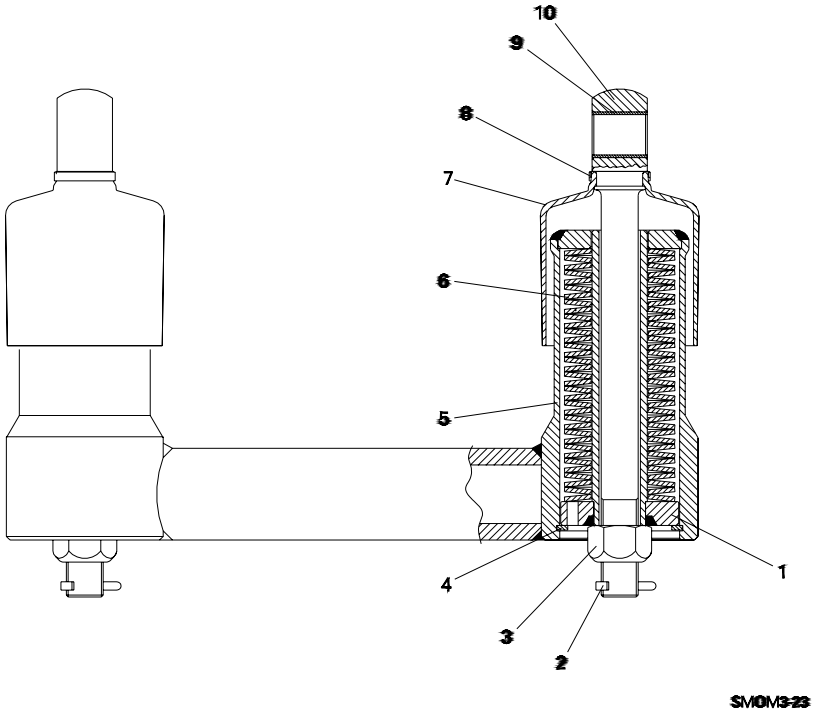

Figure 3-23. Support spring

Pos.	Name	Pos.	Name
1	Guide sleeve	6	Disk spring
2	Split pin	7	Protective housing
3	Nut	8	Strip
4	Clamp ring	9	Plain bearing
5	Spring casing	10	Draft bar

Table 3-24. Items in figure 3-23

3.2.4.6 Centring Device

Since the centring device is equipped with two identical centring cylinders, the following dismounting/disassembly instruction is done twice (one for each cylinder).

Dismounting of bearing bracket

Numbers in parentheses ( ) refer to figure 3-20.

1. Unscrew and remove the four screws (1).
2. Remove the split pin (33) and pull out the cylinder pin (34).
3. Remove the roller (26) and the bearing (27) from the link (28).
4. Remove the bearing bracket (12) from the centring suspension (14).
5. Pull out and discard the two slotted pins (2).

Dismounting of centring cylinders

Numbers in parentheses ( ) refer to figure 3-20.

1. Remove the split pin (22) and the washer (21).
2. Pull out the pin (23).
3. Remove the split pin (31).
4. Push out the pin (32) and remove the link (28) from the centring suspension (14).
5. Repeat step 1 to 4 for the other cylinder.

Disassembly of centring cylinders

Numbers in parentheses ( ) refer to figure 3-24.

1. Unscrew the eight screws (7 and 13) and remove the washers (8 and 12).
2. Remove the gable (6) and pull out the piston rod (16) together with the piston (2).
3. Unscrew the nut (9) and remove the washer (10).
4. Remove the piston (2) from the piston rod (16).
5. Repeat step 1 to 4 for the other cylinder.

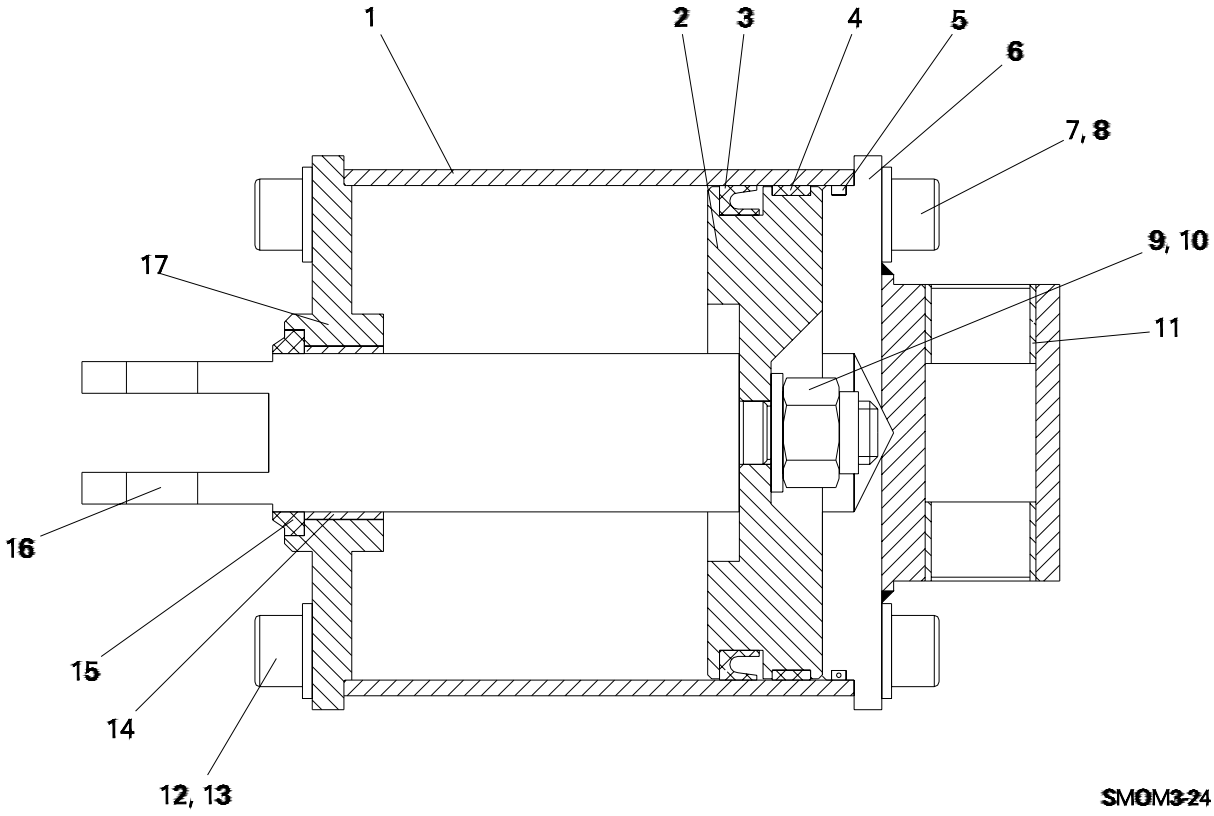

Figure 3-24. Centring cylinder

Pos.	Name	Pos.	Name
1	Tube	10	Washer
2	Piston	11	Bearing
3	Piston seal	12	Washer
4	Bearing	13	Screw
5	O-ring	14	Bearing
6	Gable	15	Wiper
7	Screw	16	Piston rod
8	Washer	17	Gable
9	Nut		

Table 3-25. Items in figure 3-24

3.2.4.7 Control Box

Dismounting of control box

Dismount the control box from the car according to the Maintenance Manual.

Disassembly of control box

Numbers in parentheses ( ) refer to figure 3-25.

1. Unscrew the four screws (9) on both sides of the control box and remove the two covers (8).
2. Disconnect the cables of the four receptacles (1, 4, 5 and 6) from the terminal (45) and from the switch (35).
3. Unscrew the four screws (3) and the four nuts (2) from each receptacle (1, 4, 5 and 6) and remove the receptacles out of the box.
4. Unscrew the two nuts (17) and remove the terminal (45).
5. Unscrew the four nuts (39) and the remove the four screws (41) and washers (40).
6. Unscrew and remove the stop screw (30).
7. Unscrew the four screws (31) and remove the four nuts (32) and the washers (33).
8. Take out the switch (35) together with the bracket plates (21 and 37), from the box (7).
9. Unscrew the 12 screws (20) and remove the bracket (21) from the switch (35).
10. Unscrew the 12 nuts (46) and remove the 12 washers (47) and the screws (48). Remove the bracket (37) from the switch.
11. Unscrew the four screws (28) and remove the washers (29). Remove the rotary actuator (25) and the seal (22) from the box (7).
12. Remove the cotter pin (27) and remove the manual handle (26) from the rotary actuator (25).

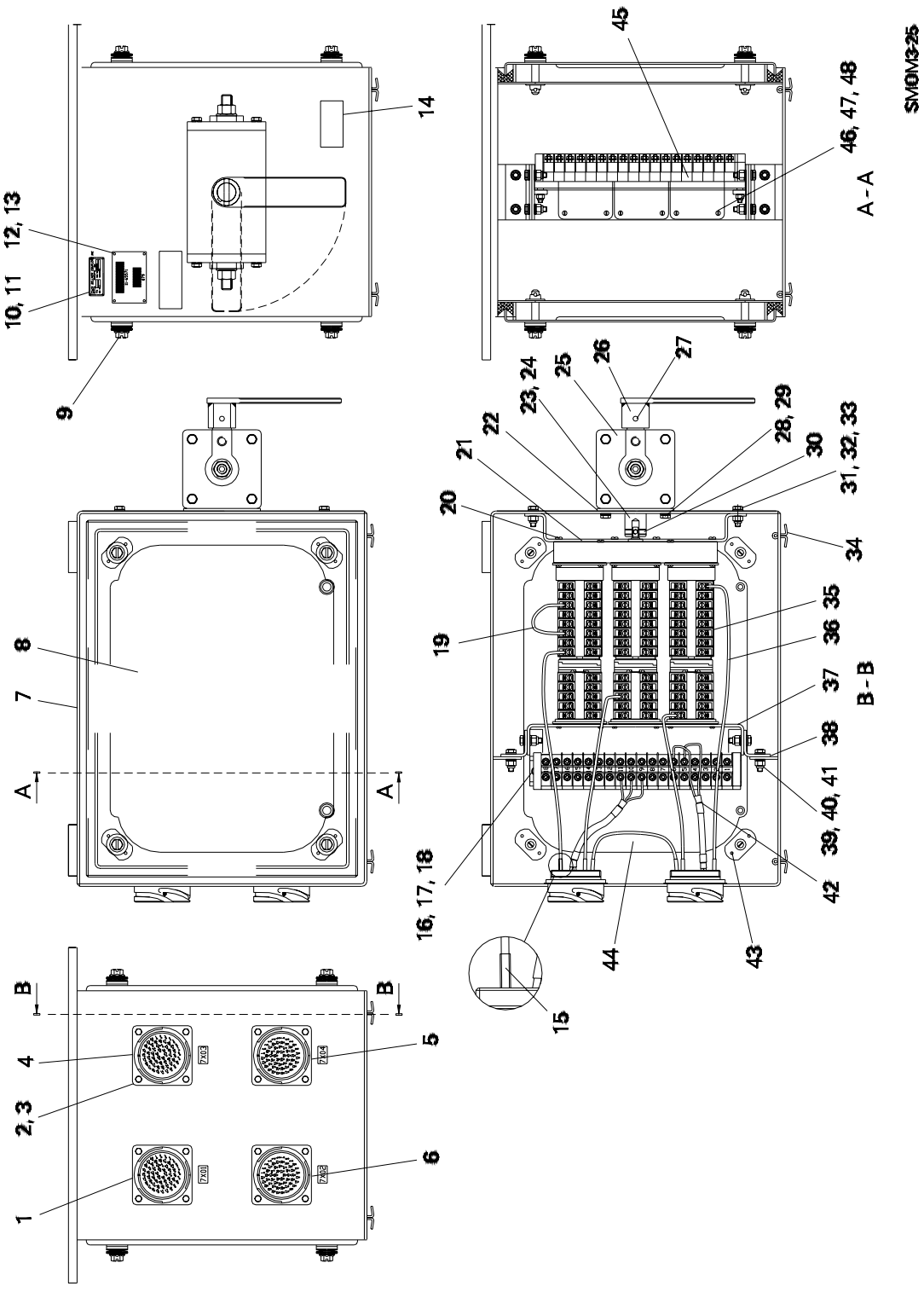

Figure 3-25. Control box

Pos.	Name	Pos.	Name
1	Receptacle	25	Rotary actuator
2	Nut	26	Manual handle
3	Screw	27	Cotter pin
4	Receptacle	28	Screw
5	Receptacle	29	Washer
6	Receptacle	30	Stop screw
7	Box	31	Screw
8	Cover	32	Nut
9	¼-screw	33	Washer
10	Type plate	34	Split pin
11	Rivet	35	Switch C10
12	Rivet	36	Cable kit
13	Bar code sign	37	Bracket plate
14	Sticker set	38	Bracket plate
15	Shrink tube	39	Nut
16	Screw	40	Washer
17	Nut	41	Screw
18	Washer	42	Cable kit
19	Cable kit	43	Rivet
20	Screw	44	Cable kit
21	Bracket plate	45	Terminal
22	Seal	46	Nut
23	Shaft	47	Washer
24	Key	48	Screw

Table 3-26. Items in figure 3-25

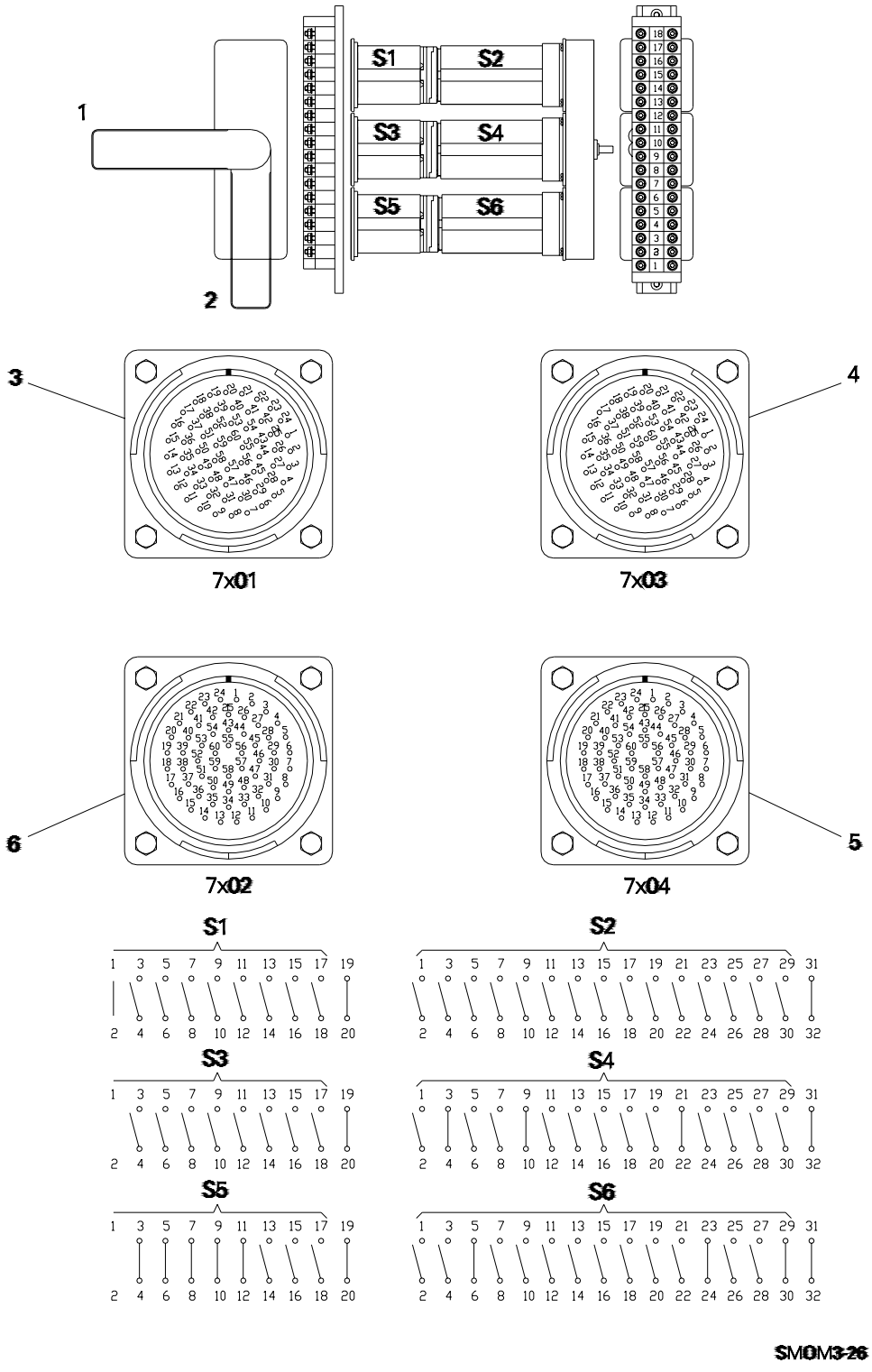

Figure 3-26. Connections

Pos.	Name	Pos.	Name
1	Uncouple	4	Receptacle, coupler, right (80°)
2	Couple	5	Receptacle, coupler, left (0°)
3	Receptacle, car, right (80°)	6	Receptacle, car, left (0°)

Table 3-27. Items in figure 3-26

Coupler end			Car end			
7X04	**Wire**	**Switch No.**	**Switch No.**	**Wire**	**7X01**	**7X02**
3	L3	S4.1	-	-	-	-
-	-	-	S4.2	S4.3	-	-
-	-	-	S4.4	S4.6	-	-
4	L4	S4.5	-	-	-	-
5	L5	S4.7	-	-	-	-
6	L6	S4.11	-	-	-	-
7	L7	S4.13	-	-	-	-
8	L8	S4.15	-	-	-	-
9	L9	S1.3	-	-	-	-
10	L10	S1.5	-	-	-	-
11	L11	S1.7	S1.8	L11	12	
12	L12	S1.11	-	-	-	-
13	L13	S1.13	-	-	-	-
14	L14	S1.15	-	-	-	-
15	L15	S1.17	-	-	-	-
16	L16	S3.1	-	-	-	-
17	L17	S3.3	-	-	-	-
18	L18	S3.5	-	-	-	-
19	L19	S3.7	-	-	-	-
20	L20	S3.9	-	-	-	-
21	L21	-	-	L21	4	
22	L22	S3.11	-	-	-	-
23	L23	S3.13	-	-	-	-
24	L24	S3.15	-	-	-	-

Coupler end			Car end			
7X04	Wire	Switch No.	Switch No.	Wire	7X01	7X02
25	L25	S3.17	-	-	-	-
26	L26	S2.1	-	-	-	-
27	L27	S2.3	S2.4	L27	-	25
28	L28	S2.7	S2.8	L28	-	27
29	L29	S2.11	S2.12	L29	-	29
30	L30	S2.15	-	-	-	-
31	L31	S2.17	-	-	-	-
32	L32	S2.19	-	-	-	-
33	L33	S2.21	S2.22	L33	-	3
34	L34	S2.25	S2.26	L34	-	19
35	L35	S6.9	-	-	-	-
36	L36	S2.29	S2.30	L36		23
37	L37	S6.3	-	-	-	-
38	L38	S6.7	-	-	-	-
39	L39	S4.19	-	-	-	-
40	L40	S4.17	-	-	-	-
41	L41	S6.11	S6.12	L41	-	21
42	L42	S6.15	-	-	-	-
43	L43	S6.17	-	-	-	-
44	L44	S6.19	-	-	-	-
45	L45	S6.21	-	-	-	-
-	-	S6.22	S6.23	-	-	-
-	-	S6.24	S6.26	-	-	-
46	L46	S6.25	-	-	-	-
47	L47	S6.27	-	-	-	-
48	L8	S5.1	-	-	-	-
-	-	-	S5.4	NC1	27	-
-	-	-	S5.3	NC1	28	-
-	-	-	S5.6	NC2	29	-

Coupler end			Car end			
7X04	**Wire**	**Switch No.**	**Switch No.**	**Wire**	**7X01**	**7X02**
-	-	-	S5.5	NC2	30	-
-	-	-	S5.7	NC3	32	-
-	-	-	S5.10	NC4	33	-
-	-	-	S5.9	NC4	34	-
-	-	-	S5.12	NC5	35	-
-	-	-	S5.11	NC5	36	-
-	-	-	S4.22	NC6	-	43
-	-	-	S4.21	NC6	-	44
-	-	-	S4.24	N01	25	-
-	-	-	S4.23	NO1	26	-
-	-	-	S4.26	NO2	-	46
-	-	-	S4.25	NO2	-	47
-	-	-	S5.14	NO5	-	48
-	-	-	S5.13	NO5	-	49

Table 3-28. Wiring connection, left hand

Coupler end			Car end			
7X04	**Wire**	**Terminal**	**Terminal**	**Wire**	**7X01**	**7X02**
49	L49	12	12	49	-	30
50	L50	11	11	50	-	31
58	L58	10	10	SH.49 -54	-	32
51	L51	7	7	51	-	33
52	L52	6	6	52	-	34
58	L58	9	9	SH. 59-54	-	32
53	L53	5	5	53	-	35
54	L54	4	4	54	-	36
58	L58	8	8	SH. 49-54	-	32
55	L55	3	3	55	-	37
56	L56	2	2	56	-	38
57	L57	1	1	SH. 55/56	-	39
59	L59	13	13	SH.39 /40	-	14
60	L60	14	14	SH.18 /19	42	-
1	L1	15	15	L-R1	1	-
2	L2	16	16	2	3	-

Table 3-29. Wiring connection, left hand

Coupler end			Car end			
7X03	**Wire**	**Switch No.**	**Switch No.**	**Wire**	**7X01**	**7X02**
-	-	-	S1.2	1	2	-
3	R3	S4.1	S2.2	3	6	-
4	R4	S4.5	S4.6	4	5	-
5	R5	S4.7	S4.8	5	8	-
-	-	S4.8	S4.9	-	-	-
-	-	S4.10	S4.12	-	-	-
6	R6	S4.11	S4.12	6	9	-
7	R7	S4.13	S4.14	7	10	-
8	R8	S4.15	S4.16	8	7	-
9	R9	S1.3	S1.4	9	-	1
10	R10	S1.5	S1.6	10	-	9
11	R11	S1.9	S1.10	R11	13	-
12	R12	S1.11	S1.12	12	37	-
13	R13	S1.13	S1.14	13	38	-
14	R14	S1.15	S1.16	14	-	7
15	R15	S1.17	S1.18	15	39	-
16	R16	S3.1	S3.2	16	20	-
17	R17	S3.3	S3.4	17	-	40
18	R18	S3.5	S3.6	18	40	-

Coupler end			Car end			
7X03	**Wire**	**Switch No.**	**Switch No.**	**Wire**	**7X01**	**7X02**
19	R19	S3.7	S3.8	19	41	-
20	R20	S3.9	S3.10	20	-	5
22	R23	S3.13	S3.14	23	-	41
23	R23	S3.13	S3.14	23	-	41
24	R24	S3.15	S3.16	24	14	-
25	R25	S3.17	S3.18	25	-	2
26	R26	S2.1	S2.2	26	15	-
27	R27	S2.5	S2.6	R27	-	24
28	R28	S2.9	S2.10	R28	-	26

29	R29	S2.13	S2.14	R29	-	28
30	R30	S2.15	S2.16	30	16	-
31	R31	S2.17	S2.18	31	19	-
32	R32	S2.19	S2.20	32	18	-
33	R33	S2.23	S2.24	R33	-	4
34	R34	S2.27	S2.28	R34	-	18
35	R35	S6.9	S6.10	35	-	42
36	R36	S6.1	S6.2	R36	-	22
37	R37	S6.3	S6.4	37	-	16
-	-	S6.4	S6.5	-	-	-
-	-	S6.6	S6.8	-	-	-
38	R38	S6.7	S6.8	38	-	17
39	R39	S4.19	S4.20	39	-	13
40	R40	S4.17	S4.18	40	-	12
41	R41	S6.13	S6.14	R41	-	20
42	R42	S6.15	S6.16	42	-	8
43	R43	S6.17	S6.18	43	17	-
44	R44	S6.19	S6.20	44	-	10
45	R45	S6.21	S6.22	45	21	-
46	R46	S6.25	S6.26	46	22	-
47	R47	S6.27	S6.28	47	23	-

Coupler end			**Car end**			
7X03	**Wire**	**Switch No.**	**Switch No.**	**Wire**	**7X01**	**7X02**
-	-	S6.28	S6.29	-	-	-
-	-	S6.30	S5.2			
48	R48	S5.1	S5.2	48	24	-

Table 3-30. Wiring connection, right hand

Coupler end			Car end			
7X03	**Wire**	**Terminal**	**Terminal**	**Wire**	**7X01**	**7X02**
49	R49	12	-	-	-	-
50	R50	11	-	-	-	-
58	R48	10	-	-	-	-
51	R51	7	-	-	-	-
52	R52	6	-	-	-	-
58	R58	9	-	-	-	-
53	R53	5	-	-	-	-
54	R54	4	-	-	-	-
58	R58	8	-	-	-	-
55	R55	3	-	-	-	-
56	R56	2	-	-	-	-
57	R57	1	-	-	-	-
59	R59	13	-	-	-	-
60	R60	14	-	-	-	-
1	R1	15	15	-	-	-
2	R2	16	-	-	-	-
21	R21	16	-	-	-	-

Table 3-31. Wiring connection, right hand

3.2.5 Cleaning/Painting

After every water-cleaning the coupler must be lubricated. Lubricate according to the Maintenance Manual.

WARNING: Solvents
Follow the safety precautions in section 3.2.2.6.

3.2.5.1 Electrical Coupler Heads

CAUTION: Electrical equipment
Follow the safety precautions in section 3.2.2.7.

1. Clean the contact housing, cover and gasket with a suitable solvent and dry thoroughly with compressed air.

2. The receptacle, internal wiring, contact block and contacts should be cleaned with a solution that will not deteriorate the components. Dry thoroughly.

3. If contacts are stiff, apply more solution while pushing contacts in and out.

4. Scrub contacts with a non-metallic scrub brush. Rinse clean and wipe dry.

5. Polish contacts until a shiny silver surface appears.

6. Repaint any scratched or marred surfaces.

3.2.5.2 Pneumatic System

1. Clean all parts with an approved solvent or detergent. Rinse thoroughly and blow dry with compressed air.

2. Scratched or marred areas should be repainted.

3.2.5.3 Mechanical Coupler Head

1. Clean all parts with an approved solvent or detergent. Rinse thoroughly and blow dry with compressed air. Keep solvents and water away from the cylinder rod of the uncoupling cylinder.

2. Scratched or marred areas should be repainted. Mask areas such as the cylinder bushings and treads.

3.2.5.4 Draft Gear and Buffer

1. Clean all parts with an approved solvent or detergent. Rinse thoroughly and blow dry with compressed air.

2. Scratched or marred areas should be repainted.

3.2.5.5 Vertical Support and Height Adjustment

1. Clean all parts with an approved solvent or detergent. Rinse thoroughly and blow dry with compressed air.

2. Scratched or marred areas should be repainted.

3.2.5.6 Centring Device

1. Clean all parts with an approved solvent or detergent. Rinse thoroughly and blow dry with compressed air.

2. Scratched or marred areas should be repainted.

3.2.5.7 Control Box

CAUTION: Electrical equipment
Follow the safety precautions in section 3.2.2.7.

1. Clean the box and cover with a suitable solvent and dry thoroughly with compressed air.

2. The receptacles, internal wiring and switch should be cleaned with a solution that will not deteriorate the components. Dry thoroughly.

3.2.6 Inspection

3.2.6.1 Coupler Head Joint after collision or other heavy impact

DANGER: Moving vehicle
Special precautions must be taken so that vehicle movement will not result in severe injury or death and/or damage to equipment.

To avoid accidents, do the following:

While working, engage the vehicle parking brake and apply stop blocks to the wheels of the vehicle.
Follow the safety precautions in section 3.2.2

If the automatic coupler has been involved in a collision, or been subject to any other heavy impact, the threaded joint which connects the Coupler Head to the Gas hydraulic Damper should be inspected as follows.

1. Inspect the colour marking of the M20 bolt with corresponding nut.
   - If the colour marking is damaged, contact Dellner couplers for further instructions.
   - If the colour marking is <u>not</u> damaged, proceed to step 2.

2. Carefully clean the area where marking paint should be applied. Use low aromatic white spirit or equivalent. Wipe dry with lint free cloth.

3. Apply a distinct and clearly visible line as in Figure 3-27. Use Permanent Marker, Yellow, Part No. 6103 000 000.

4. If applicable, repeat step 2 and 3 on the opposite side of the threaded joint (180°)

5. Inspect the colour marking after 14 days.
   - If the colour marking indicates that the Gas hydraulic Damper has rotated in relation to the Coupler Head, contact Dellner couplers for further instructions.
   - If the colour marking <u>does not</u> indicate that the Gas hydraulic Damper has rotated in relation to the Coupler Head, inspect again after another 14 days.

6. - If the colour marking indicates that the Gas hydraulic Damper has rotated in relation to the Coupler Head, contact Dellner couplers for further instructions.
   - If the colour marking does not indicate that the Gas hydraulic Damper has rotated in relation to the Coupler Head, inspect again after another 28-30 days-

7. - If the colour marking indicates that the Gas hydraulic Damper has rotated in relation to the Coupler Head, contact Dellner couplers for further instructions.
   - If the colour marking does not indicate that the Gas hydraulic Damper has rotated in relation to the Coupler Head, inspect at regular Preventive Maintenance Inspection intervals.(Every 60 days/ 50 000 km/ 60 000km, whichever is applicable on your fleet.)

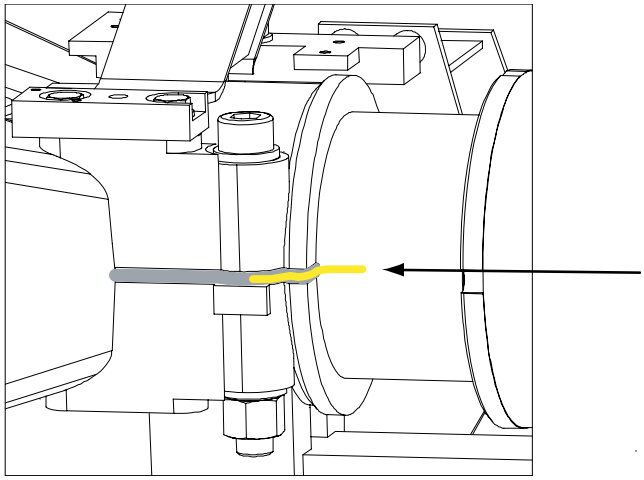

Figure 3-27. Colour marking

3.2.6.2 Mechanical Coupler Head

1. Inspect the main pin bearings for excessive wear or damage. Remove and replace damaged bearings.

2. Measure hook for wear and replace if excessive wear is evident.

3. Inspect the guide pins and guide bushings for cracks, wear or damage. The maximum inside bushing diameter should be 1.342 inches. Replace if bushings have worn to a larger diameter. Inspect guide pins for burrs or rolled edges and file if necessary.

3.2.6.3 Electrical Coupler Heads

1. Inspect contacts for pitting, burring, excessive wear, damaged contacts, weak contact spring pressure or any other condition that may cause unsatisfactory service. Replace contacts as required.

2. Inspect the contact block for breakage/cracking, electrical tracking, burning, physical damage or any other condition that may result in unsatisfactory service. Replace as necessary.

3. Check the contact housing for physical damage. Replace as necessary.

3.2.6.4 Pneumatic System

1. Inspect all items for signs of excessive wear, rust or damage. Replace as necessary.

2. Inspect the filter element for signs of wear or dirt. Degrease, clean or replace if necessary.

3. Inspect all hoses for damage or deterioration.

3.2.6.5 Draft Gear and Buffer

1. Inspect all items for signs of excessive wear, rust or damage. Replace as necessary.

2. Inspect the hydraulic buffer for signs of oil leakage. Replace leaking hydraulic buffer.

3. Inspect spherical rubber bearing for signs of dried rubber. Replace if rubber looks dry and cracked.

4. Test press the hydraulic buffer in a press. Compress the hydraulic buffer to its pre-tensioned (installed) length 43.78 inches. The load should then normally be 50 kN. If the load has decreased to 60 % of its original load, the hydraulic buffer has to be replaced. Watch and listen to the buffer during compression and decompression to discover possible play.

3.2.6.6 Vertical Support and Height Adjustment

1. Inspect all items for signs of excessive wear, rust or damage. Replace as necessary.

2. Inspect protecting cover for signs of dried rubber. Replace if rubber looks dry and cracked.

3. Inspect all disc spring elements for cracking or signs of fatigue. Disc springs should be replaced if they no longer can support the couplers vertical position.

3.2.6.7 Centring Device

1. Inspect all items for signs of excessive wear, rust or damage. Replace as necessary.

2. Inspect all rubber parts for wear or deterioration. Replace as necessary.

3.2.6.8 Control Box

1. Inspect all items for signs of excessive wear, rust or damage. Replace as necessary.

2. Inspect the switch for breakage/cracking, electrical tracking, burning, physical damage or any other condition that may result in unsatisfactory service. Replace as necessary.

3.2.7 Repair

Repair of the automatic coupler is performed by replacing damaged/worn components. See chapters 'Disassembly' and 'Reassembly' for instructions of each assembly.

3.2.7.1 Electrical Coupler Heads

1. Any parts displaying signs of breaking/cracking, excessive wear, damage or in a condition that may cause unsatisfactory operation must be replaced.

2. Repair of the electrical coupler head is performed by replacing damaged/worn components.

3.2.7.2 Pneumatic System

1. Any parts displaying signs of breaking/cracking, excessive wear, damage or in a condition that may cause unsatisfactory operation must be replaced.

2. Repair of the pneumatic system is performed by replacing damaged/worn components.

3. Repair of the filter is performed by replacing the filter element.

3.2.7.3 Mechanical Coupler Head

1. Any parts displaying signs of breaking/cracking, excessive wear, damage or in a condition that may cause unsatisfactory operation must be replaced.

2. Repair of the mechanical coupler head is performed by replacing damaged/worn components.

3.2.7.3.a Replacement of electrical coupler contacts

1. Remove the contacts by pulling them out with a special tool for spring contacts 186917.

2. Mount new contacts by pushing them into position by hand. Make sure they are pushed to a distinct stop.

3.2.7.4 Draft Gear and Buffer

1. Any parts displaying signs of breaking/cracking, excessive wear, damage or in a condition that may cause unsatisfactory operation must be replaced.

2. Repair of the draft gear and buffer is performed by replacing damaged/worn components.

3. The hydraulic buffer should be replaced if damaged or if it does not sustain its pre-load.

3.2.7.5 Vertical Support and Height Adjustment

1. Any parts displaying signs of breaking/cracking, excessive wear, damage or in a condition that may cause unsatisfactory operation must be replaced.

2. Repair of the vertical support and height adjustment is performed by replacing damaged/worn components.

3. Disc springs should be replaced if they no longer can sustain the couplers vertical position.

3.2.7.6 Centring Device

1. Any parts displaying signs of breaking/cracking, excessive wear, damage or in a condition that may cause unsatisfactory operation must be replaced.

2. Repair of the centring device is performed by replacing damaged/worn components.

3.2.7.7 Control Box

1. Any parts displaying signs of breaking/cracking, excessive wear, damage or in a condition that may cause unsatisfactory operation must be replaced.

2. Repair of the control box is performed by replacing damaged/worn components.

3.2.8 Reassembly

3.2.8.1 Lubrication and Torque Wrench Settings at Reassembly.

Lubrication

Lubricate all screws, nut threads and mating metal surfaces with anti-seizing compound (copper paste or similar) at reassembly.

Torque Wrench Settings

All screw applications made from steel and Stainless Steel in a coupler construction is covered with this instruction. Screws/nuts are to be tightened to specified torque to reach requested reliability and function.

Steel screws with strength class 8.8 (grade 5) electro zinc plated, shall be torque tightened according to table.

Stainless Steel screws with strength Class 70, shall be torque tightened according to tables.

Use lubrication on screws according to manufacturer's recommendation or as stated on the drawing.

Use only calibrated torque wrenches.

Note: Screws/nuts with other strength and surface treatment are to be torque tightened according to manufacturer's recommendations.

Conversion chart from lbft to Nm

In the table below the tightening torques (±5%) for lubricated fasteners are listed. Always lubricate with Molykote 1000 or equal unless Loctite should be applied. Zinc plated fasteners tensile strength 8,8 (ISO) grade 5 (SAE) and stainless steel fasteners tensile strength Class 70 and 80.

This tightening torques applies for all fasteners unless otherwise specified within the instructions.

	TORQUE			
	8.8 fzb	Class 70	8.8 fzb	Class 70
Dim UNC	lbft	lbft	Nm	Nm
1/4"	7	6	9,5	8
5/16"	14	12	19	16
3/8"	24	21	33	28
7/16"	39	32	52	43
1/2"	59	49	80	66
9/16	84	69	114	94
5/8"	116	97	157	131
3/4"	204	170	277	231
7/8"	327	272	444	369
1"	490	408	664	553

Table 3-32. Torque wrench settings, UNC fasteners

	TORQUE			
	8.8 fzb	Class 70	8.8 fzb	Class 70
Dimension	lbft	lbft	Nm	Nm
M5	3,7	3	4,7	4,1
M6	6,2	5	8,4	7
M8	15,2	12,5	20,6	17
M10	30	24	40	33
M12	52	42	70	57
M16	125	103	169	140
M20	244	201	331	273
M24	422	348	572	472

Table 3-33. Torque wrench settings, metric fasteners

Joints with torque specified on the drawing is recalculated as follows:
Torque in (lbft) x 1,356 = Torque in (Nm). E.g. 800 lbft x 1,356 = 1085 Nm

3.2.8.2 Control Box

Assembly of control box

Numbers in parentheses ( ) refer to figure 3-25.

1. Place the manual handle (26) on the rotary actuator (25) and install the cotter pin (27).
2. Place the rotary actuator (25) with the seal (22) on the box (7), and tighten the four screws (28) together with the washers (29).
3. Place the first bracket (37) on the switch and tighten the 12 nuts (46), the 12 washers (47) and the 12 screws (48).
4. Place the second bracket (21) on the switch (35) and tighten the 12 screws (20).
5. Place the terminal (45) on the bracket (37) and tighten the two nuts (17), the two washers (18) and the 2 screws (16).
6. Place the switch (35) with the mounted bracket plates (21 and 37) and the terminal (45), inside of the box (7).
7. Tighten the four nuts (32), the four screws (31) and the four washers (33) in the first end of the switch.
8. Now tighten the four nuts (39), the four screws (41) and the four washers (40) in the other end of the switch.
9. Tighten the stop screw (30) and seal the screw with Loctite 242.
10. Place each receptacle (1, 4, 5 and 6) inside the box and tighten the four screws (3) and the four nuts (2) at each receptacle.
11. Connect the cables from the four receptacles (1, 4, 5 and 6) to the terminal (45) and to the switch (35). See also figure 3-26.
12. Place the two covers (8) on both sides of the control box and tighten the four screws (9) on each side.

3.2.8.3 Centring Device

Since the centring device is equipped with two identical centring cylinders, the following assembly/mounting instruction is done twice (one for each cylinder).

Assembly of centring cylinders

Numbers in parentheses ( ) refer to figure 3-24.

1. Position the piston (2) on the piston rod (16).
2. Install the washer (10) and tighten the nut (9).
3. Push the piston (2) into the tube (1).
4. Position the two gables (6 and 17) on the tube (1).
5. Install the eight washers (8 and 12) and tighten the eight screws (7 and 13) one by one.
6. Repeat step 1 to 5 for the other cylinder.

Mounting of centring cylinders

Numbers in parentheses ( ) refer to figure 3-20.

1. Install the link (28) on the centring suspension (14) and push in the pin (32).
2. Install the split pin (31).
3. Install the cylinder (13) and push in the pin (23) together with the bearings (24 and 25).
4. Install the washer (21) and the split pin (22).
5. Repeat step 1 to 4 for the other cylinder.

Mounting of bearing bracket

Numbers in parentheses ( ) refer to figure 3-20.

1. Install two new slotted pins (2) on the bearing bracket (12).
2. Install the bearing bracket (12) on the centring suspension (14).
3. Fasten the four screws (1).
4. Install the cylinder (13), roller (26) and the bearing (27) in the link (28).
5. Push in the cylinder pin (34) and install the split pin (33).

Mounting of centring device

Numbers in parentheses ( ) refer to figure 3-20.

1. The bearing bracket (12) is mounted together with the draft gear and buffer, see item 3.2.8.5 Draft Gear and Buffer.

3.2.8.4 Vertical Support and Height Adjustment

Assembly of support spring

The vertical support and height adjustment consists of two disc spring units which are identical. Therefore do the following instructions twice, once for each cylinder.

Numbers in parentheses ( ) refer to figure 3-23.

1. Install all disk springs (6) and the guide sleeve (1).
2. Compress the disk springs by pressing on the guide sleeve (1).
3. Install the clamp ring (4).
4. Push in the draft bar (10) together with the protective housing (7).
5. Tighten the nut (3).
6. Install the split pin (2).
7. Repeat step 1 to 6 above for the other support spring.

Assembly of vertical support and height adjustment

Numbers in parentheses ( ) refer to figure 3-20.

1. Position the two support springs (45) on the support plate (11).
2. Push in the two cylinder pins (6), one on each support spring (45).
3. Install the two washers (8) and the two split pins (7), one on each support spring (45).
4. Install the bearing (10) and tighten the two screws (9). Install the other bearing on the other support plate arm (11) in the same way.

Mounting of vertical support and height adjustment

Numbers in parentheses ( ) refer to figure 3-20.

1. The support plate (11) is mounted together with the draft gear and buffer, see item 3.2.8.5 Draft Gear and Buffer.

3.2.8.5 Draft Gear and Buffer

Assembly of draft gear

WARNING: Heavy equipment
Follow the safety precautions in section 3.2.2.3.

Numbers in parentheses ( ) refer to figure 3-22.

1. Install ring (6), tube ring spring (7) with ring feder special grease and install it. Install ring (8).
2. Mount nut (9) a couple of threads.
3. Apply mounting tool 169099 and 1002712 and press the ring package to static end load, min. 200 kN and max. 600 kN, to centre the rings relative to each other.
4. Release the ring assembly completely.
5. Compress the rings to 60 kN ±6 kN.

CAUTION: The compression of the rings must be made with a continuously increasing force. If the force value has exceeded the upper tolerance, release the press completely and start the procedure again.

6. Tighten the nut (9) and install with the bearing (11). Use special tool 168820.
7. Check that the set screw hole of the nut (9) is in alignment with the set screw hole of the hydraulic buffer. If not, adjust the nut. If the nut and/or the hydraulic buffer are new, drill a new hole ∅0.25" (6.3 mm) and depth 0.2" (5 mm) through the M8 hole for the set screw in nut (9). Depth should be measured from the outer diameter of the buffer's thread. To ensure correct drilling depth Dellner recommends the use of a boring stop.
8. Put the hydraulic buffer horizontal with the hole for the set tightenwards. Rinse the hole for the set screw with Loctite 20162 and clean, oil free, compressed air (perform this step two times). Let Loctite 20162 evaporate for approximately 2 minutes.
9. Fill the hole for the set screw with Loctite 243. Make sure there are no air bubbles under the Loctite.
10. Clean the set screw with Loctite 20162. Let Loctite 20162 evaporate for approximately 2 minutes, and then apply Loctite 243 to the set screw.
11. Mount the set screw (10) and tighten with tightening torque of 11.8 lb ft (16 Nm).
12. Mount bearing (3) on nut (4).

13. Fit stripper (2) and bearing (3) to nut (4).

14. Put a mark (A) on the flange of the nut (4) to show where the set screw hole (B) is located, Figure 3-28. **NOTE!** Only if the nut is reused.

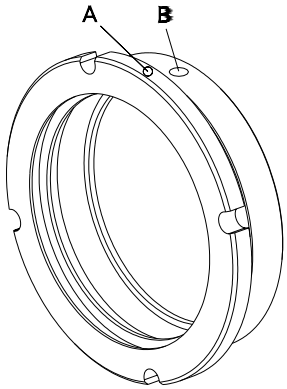

Figure 3-28. Marking of nut

15. Install the hydraulic buffer assembly into the buffer tube (12) and fit nut (4).

16. Place the buffer in a vertical hydraulic press and compress it 0.16-0.20" (4-5 mm) in order to facilitate the assembly of nut (4).

17. Tighten the nut as hard as possible by hand with wrench 161696. Mark the position (e.g. with torque seal) (Pos 1 in Figure 3-29). By means of a copper sledge and wrench 161696, force the nut (4) to an additional 10°. Pos 2 in Figure 3-29.

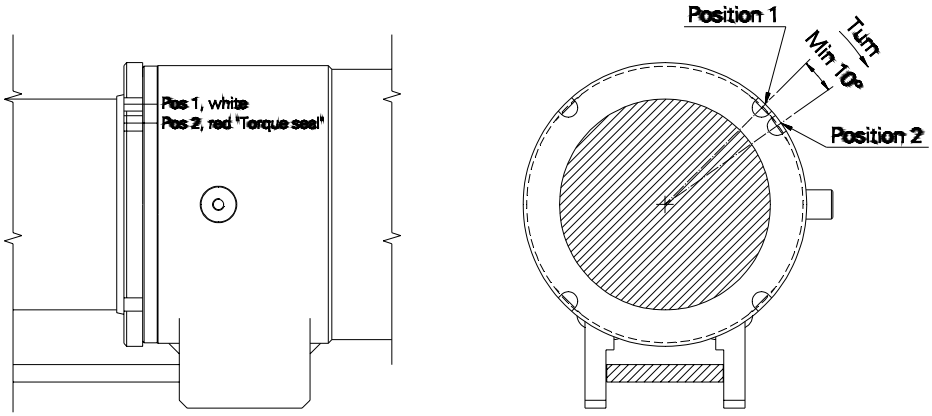

Figure 3-29. Tightening of nut

18. Check that the set screw hole in the buffer tube (12) is in alignment with the set screw hole in the nut (4) (if you have a new nut, skip the next step).

19. If not, check if the distance from the centre of the threaded set screw hole in the buffer tube to the centre of the set screw hole in the mark (A) in

Figure 3-28) is at least 0.59" (15 mm). (Figure 3-30). If the distance is less than 0.59" (15 mm), discard the nut, replace it with a new one, and proceed from step 13.

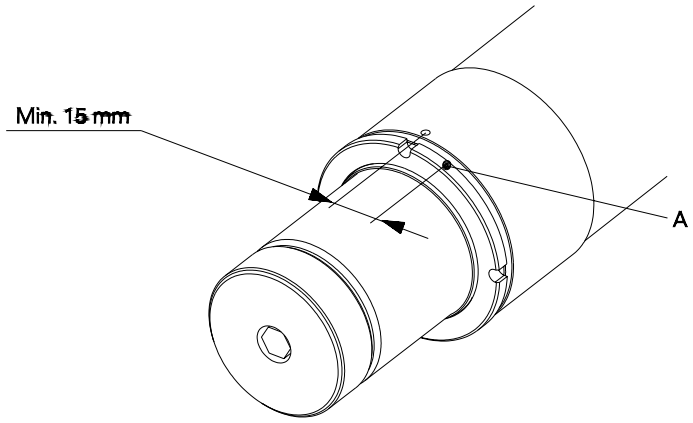

Figure 3-30. Old hole/new hole

20. Release the compress force on the buffer.

21. Put the buffer horizontal, with the hole for the set tightenwards. Through the M8 hole in the buffer tube, counter drill ∅0.25 (6.3 mm) and depth 0.2" (5 mm). Depth should be measured from the outer diameter of the nut's thread. To ensure correct drilling depth Dellner recommends the use of a boring stop.

22. Rinse the hole for the set screw with Loctite 20162 and clean, oil free, compressed air (perform this step two times). Let Loctite 20162 evaporate for approximately 2 minutes.

23. Fill the hole for the set screw with Loctite 243. Make sure there are no air bubbles under the Loctite.

24. Clean the set screw with Loctite 20162. Let Loctite 20162 evaporate for approximately 2 minutes, and then apply Loctite 243 to the set screw.

25. Mount the set screw and tighten with tightening torque of 11.8 lb ft (16 Nm).

26. Mark the nut (4)/buffer tube (12) and the set screw (5)/buffer tube (12), with red torque seal (must be easily visible when the coupler is mounted on the train).

Mounting of draft gear and buffer, centring device and vertical support

WARNING: Heavy equipment
Follow the safety precautions in section 3.2.2.3.

Numbers in parentheses ( ) refer to figure 3-20.

There is need for at least two men to mount together the draft gear and buffer, the centring device and the vertical support and height adjustment.

In order to mount together the devices, proceed as follows:

1. Push in the pin (43) together with the key (42) in the support plate (11).
2. Place the two bearings (41 and 44) in the bearing bracket (12).
3. Place the buffer (5) together with the thrust washer (35) in the bearing bracket (12).

CAUTION: The buffer is heavy. Use a lifting device.

4. Now use the lifting device to lift the buffer (5) together with the centring device onto the pin (43).
5. Place the washer (36) on the pin (43) and tighten the nut (37).
6. Place the key (40) on the nut (37) and tighten the two screws (38) together with the securing plate (39). Secure the screws by folding the corners of the securing plate against the heads of the screws.

3.2.8.6 Mechanical Coupler Head

Assembly of mechanical coupler

Numbers in parentheses ( ) refer to figure 3-21.

1. Place the bearing (12) in the hole of the hook (2).
2. Place the hook (2) inside of the coupler head and push in the main pin (3).
3. Place the securing plate (5) on the main pin (3) and tighten the screw (16) together with the securing washer (4).
4. Place the coil spring (10) on the spring support (11).
5. Press the hook (2) towards the right side of the coupler in order to be able to reinstall the uncoupling cam and uncoupling shaft. Use a screw clamp or hydraulic press.
6. Mount the uncoupling arm (8) on the under side of the mechanical head by fastening it with the screw (21) and the washer (22).

7. Align the borings in the uncoupling cam (6) and the uncoupling arm (8) with the borings in the mechanical coupler head housing. Insert the uncoupling shaft (7) from above the coupler head. Insert the split pin (26) in the uncoupling shaft (7).

8. Release the screw clamp/hydraulic press from the hook.

9. Place the uncoupling cylinder (9) on the coupler head and push in the cylinder bolt (24). Install the split pin (25).

10. Push the cylinder bolt (23) through the uncoupling arm (8) and through the rod of the uncoupling cylinder (9). Install the split pin (25).

11. Place the fold arm (27) on the uncoupling arm (8) and mount the bushing (29), screw (30), washer (31) and (28).

Mounting of mechanical coupler

Numbers in parentheses ( ) refer to figure 3-20.

1. Fit the Buffer clamp (1003706) to the hydraulic buffer (5), and the attachment (1030172) to the mechanical coupler (20).

2. Apply Lagermeister 3000+ to the threads on the damper and all other interfaces between the hydraulic buffer (5) and the mechanical coupler (20). Fit the mechanical coupler by screwing it onto the buffer.

3. Insert bars or similar into the holes of the attachment and the buffer clamp. Tighten the mechanical coupler to the hydraulic buffer with a tightening torque of 1000Nm +150 Nm/-0Nm.

4. Apply Molykote 1000 to the threads of a new screw (3) and a new nut (4). Mount the screw (3), washers and nut (4) and tighten to 331 Nm±10%.

5. Mark the screw, washers and nut with Torque mark seal, see (4) Figure 3-31.

6. Fill the slit with Silicone Sikaflex 221, see (1) Figure 3-31.

7. Align the mechanical coupler (20) to the hydraulic buffer (5) to be able mount the guide rail (48).

8. Dismount the buffer clamp (1003706) and attachment (1030172).

9. Place the guide rail (48) on the buffer (5) and tighten the four screws (47) together with the securing plate (46). Secure the screws by folding the corners of the securing plate against the heads of the screws.

10. Carefully clean the area where marking paint should be applied. Use low aromatic white spirit. Wipe dry with lint free cloth.

11. Apply a distinct and clearly visible line as in (5) Figure 3-31. Use a permanent marker, yellow, Part No 6103 000 000.

12. Push in the guide bar (53) in the guide rail (48) and tighten the four screws (57) together with the securing plate (56). Secure the screws by folding the corners of the securing plate against the heads of the screws.

13. Push in the ground cable (52) through the ground cable support on the buffer (5). Tighten the screws (54) together with the washers (55), in each end of the ground cable.

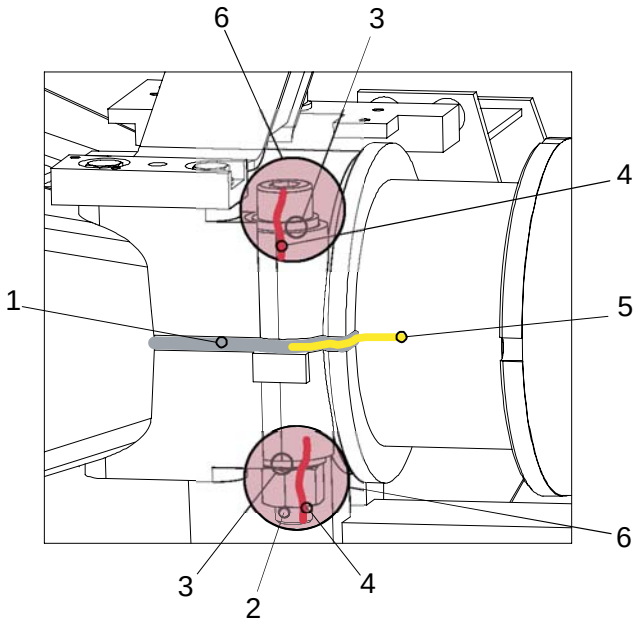

Figure 3-31, Colour marking

Pos.	Name	Pos.	Name
1	Sikaflex	4	Torque mark seal
2	Molykote 1000 on threads	5	Permanent marker, Yellow
3	No lubrication	6	CTP D 350

3.2.8.7 Pneumatic System

Assembly of pneumatic coupler

Numbers in parentheses ( ) refer to figure 3-19.

1. Place an O-ring (24) and a seal (25) on the valve rod (23).

2. Place the spring (19) together with the valve rod (23) in the valve housing (20).

3. Place the O-ring (26) in the valve housing (20).

4. Install the valve bracket (30) on the valve housing (20) and tighten the four screws (1 and 3) together with the washers (2 and 4).

5. Place a new seal (8) in the seal holder (7).

6. Install the spring (10), the lock-ring (9), the seal holder (7) and the securing washer (5) in the valve bracket (30). Tighten the two screws (6).

7. Tighten the tube (16) and the adaptor (15) on the valve housing (20).

Mounting of pneumatic system

Numbers in parentheses ( ) refer to figure 3-18.

1. Place the pneumatic coupler on the mechanical coupler head and tighten the two screws together with the washers.

2. Install the two adaptors (41 and 31).

3. Connect hose (7) between adaptor (16) and adaptor (15).

4. Connect hose (6) between adaptor (15) and adaptor (44).

5. Connect hose (5) between adaptor (15) and adaptor (31).

6. Connect hose (9).

7. Fasten the filter (22) with the two screws (25) and washers (24).

8. Connect hose (8) between adaptor (12) and adaptor (30).

9. Connect hose (4) between the adaptor on the pneumatic coupler and adaptor (32).

10. Connect hose (34) between adaptor (41) and adaptor (32).

11. Mount the plate (1), on which the valves (10 and 11) are mounted, on the mechanical coupler. Tighten the two screws (28) together with the washers (29).

3.2.8.8 Electrical Coupler Heads

Assembly of electrical coupler head

Numbers in parentheses ( ) refer to figure 3-17.

1. Install the front seal (15) on the contact device (17).
2. Place the two locking plates (16) on the front seal and push in the contact device (17) together with the receptacle in the contact housing (22).
3. Place a piece of wood over the contact device (17) and apply a screw clamp to press the contact device into the electrical head housing (22). Press the contact device into the housing until the four screws (1) can be mounted. Tighten the four screws (1) together with the four washers (2).
4. Release the screw clamp.
5. Now tighten the receptacle (25) by fastens the four screws (24) and the four nuts (23). Take care not do damage the cables connected to the receptacle inside the contact housing (22).
6. Install the bearing (10) and the wiper (9).
7. Place the spring (7) inside of the contact housing (22) and push the pin (8) through the spring (7). Install the split pin (13).
8. Place the cover (14) on the pin (8). Preload the spring by turning the pin approximately half a turn (use special tool 179925), and install the roll pin (5).
9. Push in the pin (12) through the cover (14) and the contact housing (22) and install the split pin (11) and the roll pin (6).
10. Place the side cover (20) and the side seal (21) on the contact housing (22) and tighten the six screws (19) together with the washers (18).

3.2.9 Adjustment/Test

3.2.9.1 Off Car

3.2.9.1.a Electrical Coupler Heads

When the coupler heads are mounted, they must be short circuit tested. Test with 2 kV between each neighbouring contact and each contact to the housing. The cables are not allowed to be connected. Flash over indicates short circuit.

3.2.9.2 On Car

See the Maintenance Manual.

3.3 Overhaul

3.3.1 Overhaul Procedures

The term overhaul means to disassemble the device, clean thoroughly and carefully examine all components, replace all rubber parts and other parts that are worn or defective, also to replace all fasteners and check for rust.

For disassembly, cleaning/painting, inspection and reassembly procedures; see the respective chapters above.

3.3.1.1 Electrical Coupler Head

Numbers in parentheses ( ) refer to figure 3-17.

1. Disassemble the electrical coupler head according to section 3.2.4.1.
2. Thoroughly clean and paint according to section 3.2.5.1.
3. Inspect all parts according to section 3.2.6.2.
4. Replace the following parts:

   - Front seal (15),
   - Side seal (21),
   - Bearing (10).

5. Reassemble and mount the electrical coupler head according to section 3.2.8.8. Replace all fasteners at reassembly.

3.3.1.2 Pneumatic System

If nothing else is stated, numbers in parentheses ( ) refer to figure 3-19.

1. Disassemble the pneumatic system according to section 3.2.4.2.
2. Thoroughly clean and paint according to section 3.2.5.2.
3. Inspect all parts according to section 3.2.6.4.
4. Replace the following parts:

   - Hose (4), figure 3-18,
   - Hose (5), figure 3-18,
   - Hose (6), figure 3-18,
   - Hose (7), figure 3-18,
   - Hose (8), figure 3-18,
   - Hose (9), figure 3-18,
   - Hose (34), figure 3-18,
   - Filter element in filter (22), figure 3-18.

5. Reassemble and mount the pneumatic system according to section 3.2.8.7. Replace all fasteners at reassembly.

3.3.1.3 Mechanical Coupler Head

Numbers in parentheses ( ) refer to figure 3-19.

1. Disassemble the mechanical coupler head according to section 3.2.4.3.
2. Thoroughly clean and paint according to section 3.2.5.3.
3. Inspect all parts according to section 3.2.6.2.
4. Replace the following parts:

   - Bearings (12),
   - Guide bushing (14),
   - Coil spring (10).

5. Reassemble and mount the mechanical coupler head according to section 3.2.8.6. Replace all fasteners at reassembly.

3.3.1.4 Draft gear and Buffer

Numbers in parentheses ( ) refer to figure 3-22.

1. Disassemble the draft gear and buffer according to section 3.2.4.4.
2. Thoroughly clean and paint according to section 3.2.5.4.

3. Inspect all parts according to section 3.2.6.5.

4. Replace the following parts:

   - Stop screws (5 and 10),
   - Bearing (3),
   - Bearing (11),
   - Stripper (12),
   - Spherical rubber bearing (13),
   - Retaining rings (11),
   - Wear plate (15).

5. Reassemble and mount the draft gear and buffer according to section 3.2.8.5. Replace all fasteners at reassembly.

3.3.1.5 Vertical Support and Height Adjustment

If nothing else is stated, numbers in parentheses ( ) refer to figure 3-23.

1. Disassemble the vertical support and height adjustment according to section 3.2.4.5.

2. Thoroughly clean and paint according to section 3.2.5.5.

3. Inspect all parts according to section 3.2.6.6.

4. Replace the following parts:

   - Bearing (10), figure 3-20.
   - Protective housing (7),
   - Strip (8),
   - Plain bearing (9).

5. Reassemble and mount the vertical support and height adjustment according to section 3.2.8.4. Replace all fasteners at reassembly.

3.3.1.6 Centring Device

If nothing else is stated, numbers in parentheses ( ) refer to figure 3-24.

1. Disassemble the centring device according to section 3.2.4.6.
2. Thoroughly clean and paint according to section 3.2.5.6.
3. Inspect all parts according to section 3.2.6.7.
4. Replace the following parts:

   - Bearing (41), figure 3-20,
   - Bearing (44), figure 3-20,
   - Rollers (26), figure 3-20,
   - Bearings (27), figure 3-20,
   - Bearings (29 and 30), figure 3-20,
   - Bearings (24 and 25), figure 3-20,
   - Piston seal (3),
   - Wiper (15),
   - Bearing (4),
   - O-ring (5),
   - Bearing (14),
   - Bearings (15).

5. Reassemble and mount the centring device head according to section 3.2.8.3. Replace all fasteners at reassembly.

3.3.1.7 Control Box

Numbers in parentheses ( ) refer to figure 3-25.

1. Disassemble the control box according to section 3.2.4.7.
2. Thoroughly clean and paint according to section 3.2.5.7.
3. Inspect all parts according to section 3.2.6.8.
4. Replace the following parts:

   - Seal (22).

5. Reassemble and mount the control box according to section 3.2.8.2. Replace all fasteners at reassembly.

SECTION 4

DOORS AND BRIDGEPLATE

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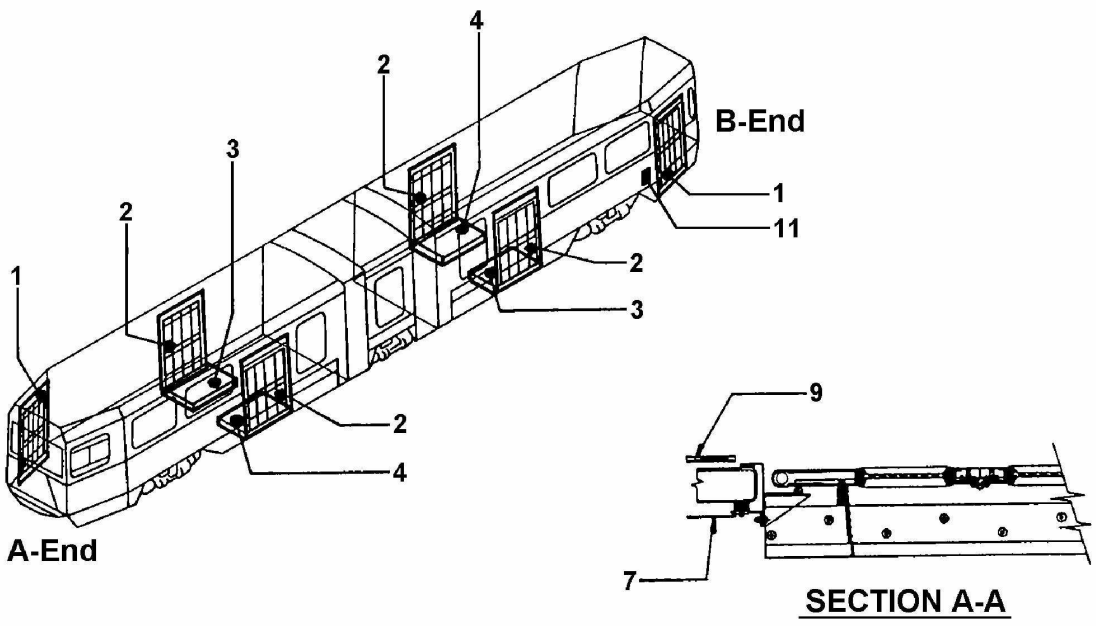


CENTER DOOR

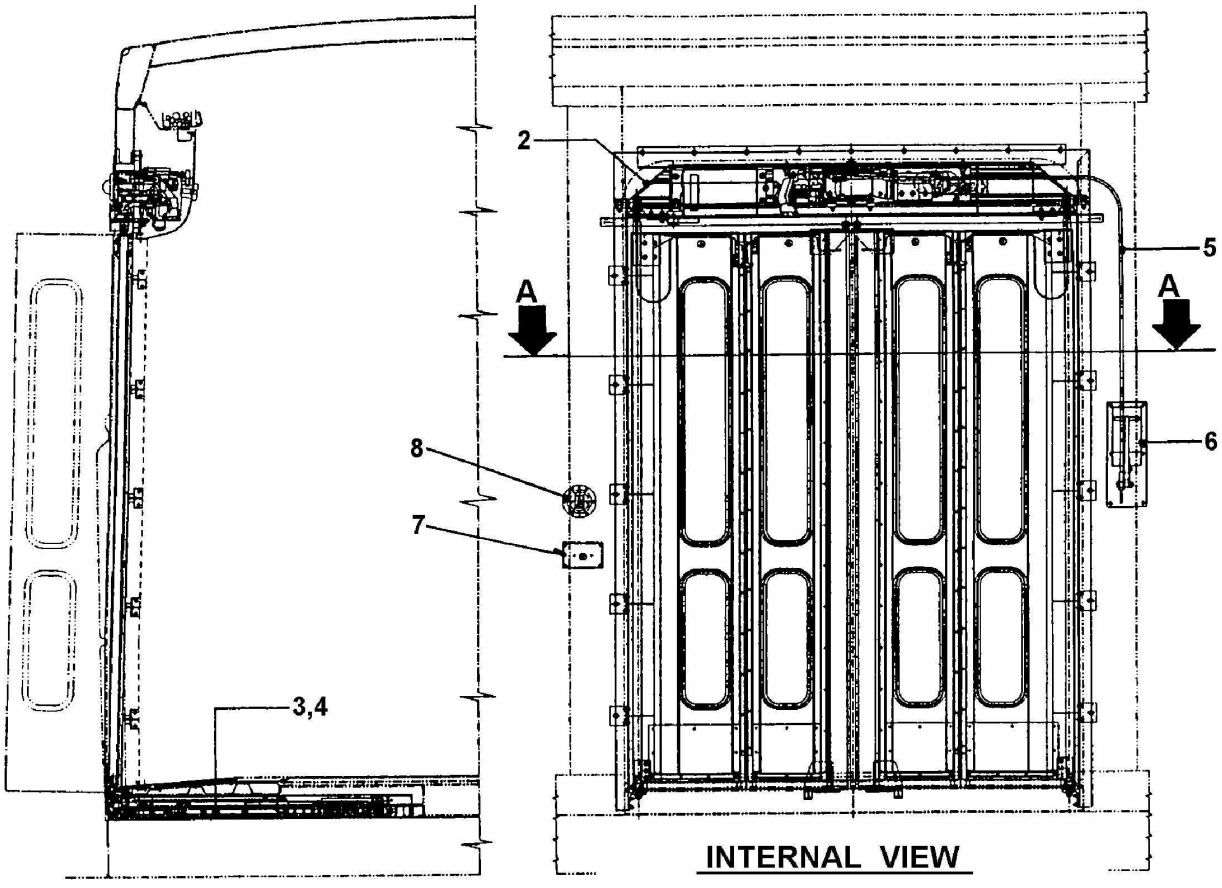
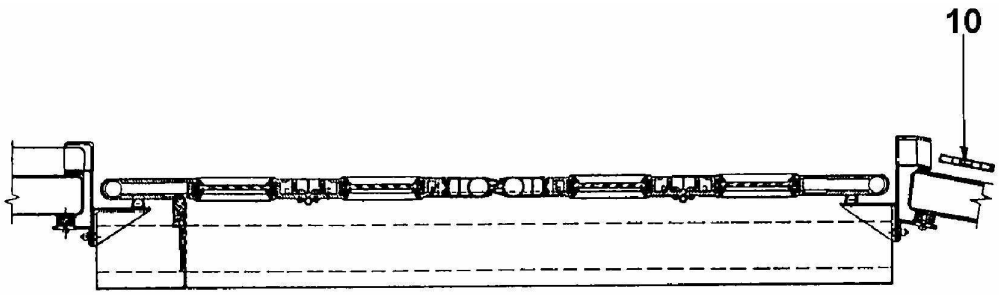
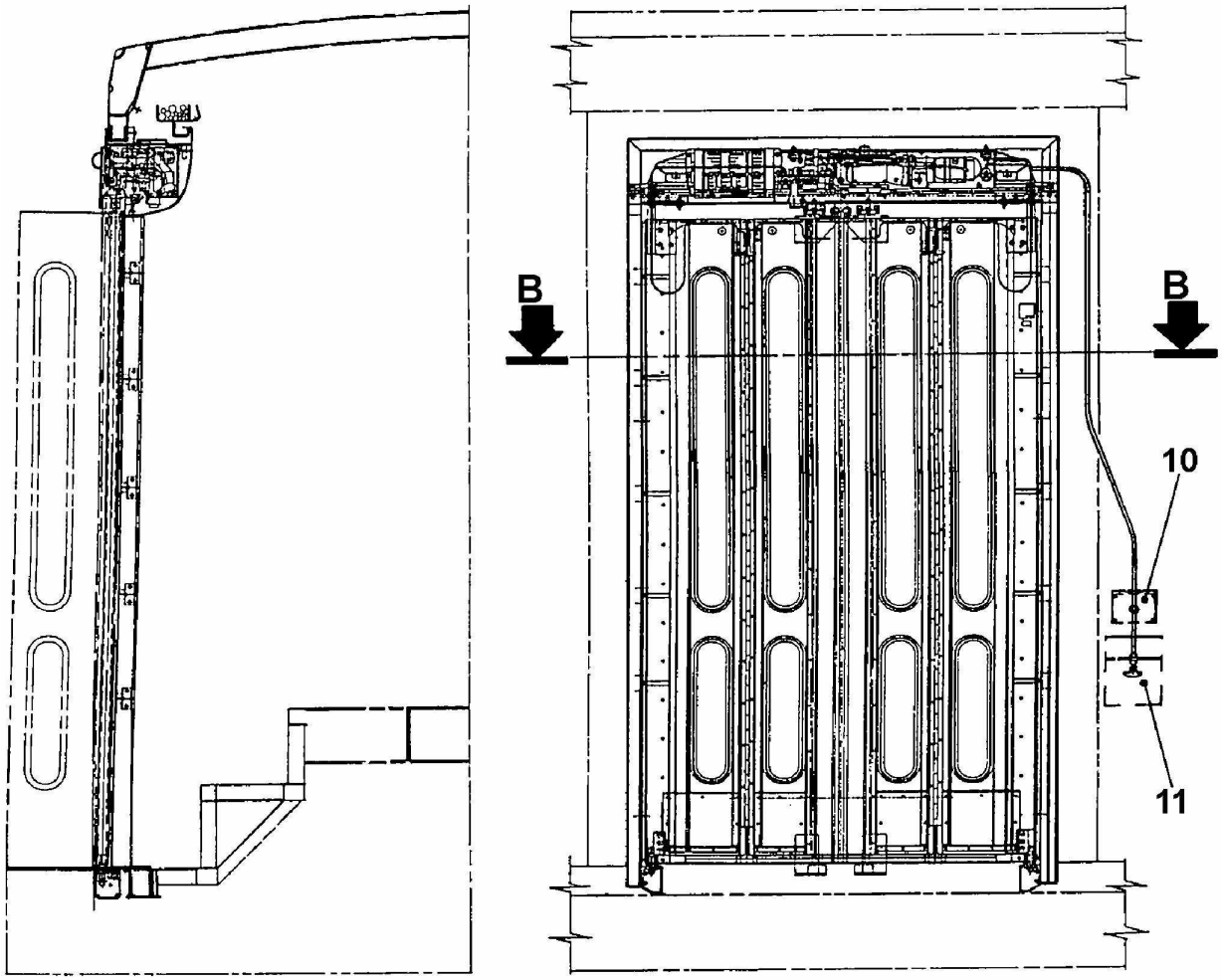


Figure 4-1 Door System (Sheet 1 of 2)



SECTION B-B

END DOOR



INTERNAL VIEW

Figure 4-1 Door System (Sheet 2 of 2)

Door System (Fig. 4-1)

Section Figure Item	P/N	OEM P/N	OEM Code	Description	MBTA Code	U/M	Qty per Assy
04-001-	NO NUMBER	NO NUMBER		DOOR SYSTEM		EA	1
1	R12354100	59566657	E0017	.DOOR MODULE, END DOOR - SEE Figure 4-2 FOR INSTALLATION - Figure 4-4 FOR DETAIL		EA	1
2	R12354200	59566658	E0017	.DOOR MODULE, CTR DOOR - SEE Figure 4-2 FOR INSTALLATION - Figure 4-26 FOR DETAIL		EA	1
3	R12354700	59566659	E0017	.BRIDGEPLATE ASSY, RH - SEE Figure 4-41 FOR INSTALLATION - Figure 4-42 FOR DETAIL		EA	1
4	R12354701	59566659-01	E0017	.BRIDGEPLATE ASSY, LH - SEE Figure 4-41 FOR INSTALLATION - Figure 4-42 FOR DETAIL		EA	1
5	59630958	59630958	E0017	.CABLE ASSY, MANUAL RELEASE - SEE Figure 4-35 FOR INSTALLATION		EA	4
6	R12354210	59660981	E0017	.MANUAL RELEASE ASSY - SEE 2-62, 2-63, 2-64 FOR INSTALLATION - Figure 4-34 FOR DETAIL		EA	1
7	R12354220	59641346	E0017	.CREW KEY SWITCH ASSY, INSIDE - SEE Figure 4-36 FOR DETAIL - 2-62, 2-63, 2-64 FOR INSTALLATION		EA	1
8	R12354222	59631343	E0017	.PUSHBUTTON, BRIDGEPLATE REQUEST- SEE. Figure 4-37 FOR DETAIL -2-13,2-16,2-20,2-63,2-64,2-88 FOR INSTALLATION		EA	1
9	R12354221	59641345	E0017	.CREW KEY SWITCH ASSY, CTR DOOR, OUTSIDE - SEE Figure 4-40 FOR DETAIL - 2-9, 2-17 FOR INSTALLATION		EA	1
10	R12354120	59446698	E0017	.CREW KEY SWITCH ASSY, END DOOR, OUTSIDE - SEE Figure 4-38 FOR DETAIL - 2-17 FOR INSTALLATION		EA	1
11	R12354124	R12354124	A0185	.CABLE INSTL, END DOOR RELEASE - SEE Figure 4-39 FOR DETAIL		EA	2

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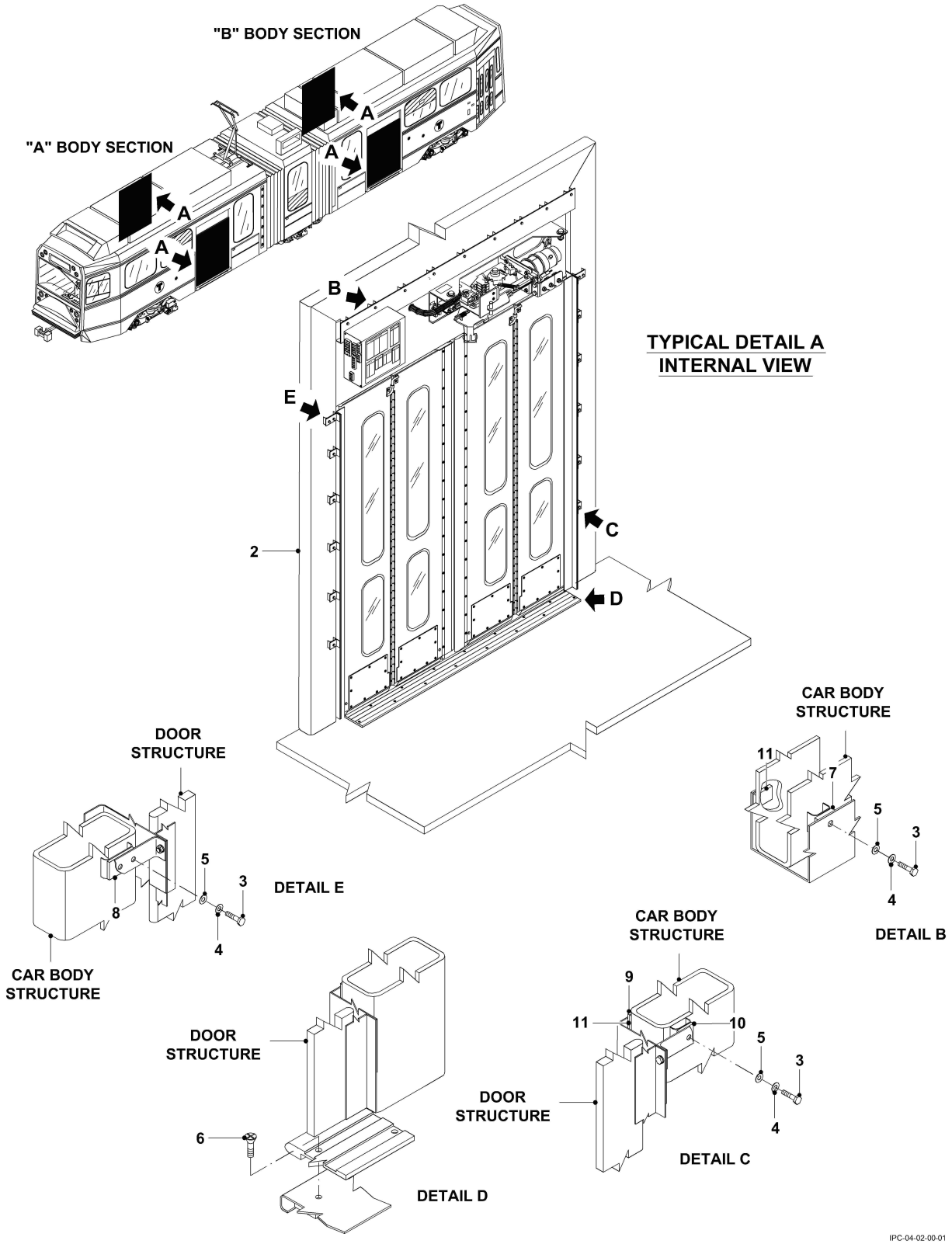

Figure 4-2 Passengers Doors Installation (Sheet 1 of 2)

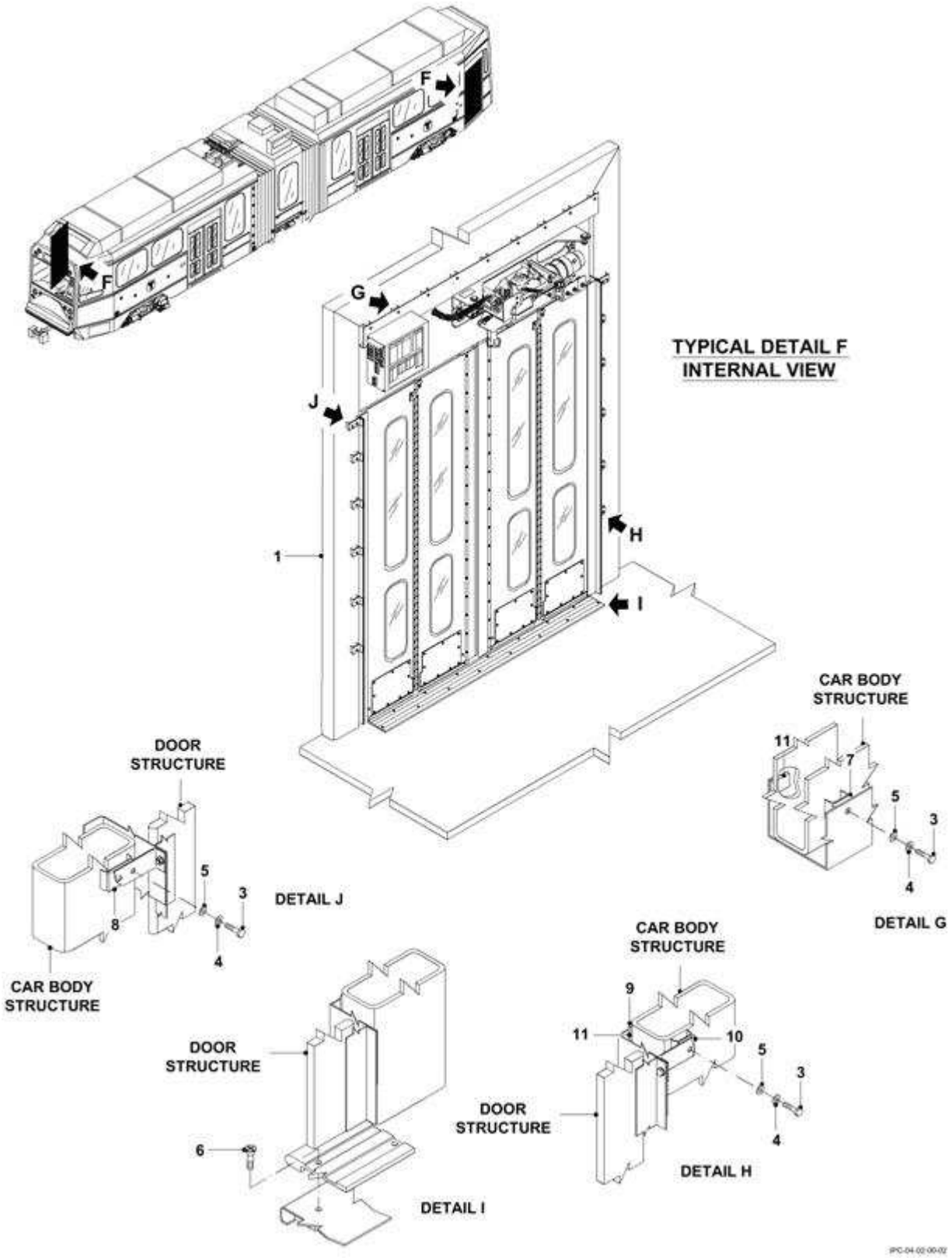

Figure 4-2 Passengers Doors Installation (Sheet 2 of 2)

Passengers Doors Installation (Fig. 4-2)

Section Figure Item	P/N	OEM P/N	OEM Code	Description	MBTA Code	U/M	Qty per Assy
04-002-	12354000	R12354000	A0185	PASSENGERS DOORS INSTALLATION		EA	1
1	12354100	59566657	E0017	.DOOR MODULE, END DOOR - SEE Figure 4-4 FOR DETAIL		EA	2
2	R12354200	59566658	E0017	.DOOR MODULE, CTR DOOR - SEE Figure 4-26 FOR DETAIL		EA	4
3	R123540001	1/4x7/8 STC 507 - S	Z9009	.BOLT, HEX - 1/4x7/8 STC 507 - ATT.PT TYPE S STC 507		EA	134
4	R123540002	1/4 STC 514 - S	Z9009	.WASHER, PLAIN - 1/4 STC 514 - ATT.PT TYPE S STC 514		EA	134
5	R123540003	1/4 STC 515 - S	Z9009	.WASHER, HEL SPRING - 1/4 - ATT.PT STC 515 - TYPE S STC 515		EA	134
6	R123540004	1/4-20 UNCx3/4 ANSI B18.3bS	Z9009	.SCREW, HEX SOCKET FLAT - ATT.PT CTSK HD - 1/4-20 UNCx3/4 ANSI B18.3 - SSTL AISI 304		EA	86
7	R12354005	R12354005	A0185	.SHIM		EA	52
8	R12354004	R12354004	A0185	.SHIM		EA	6
9	R123540006	R123540006	A0185	.RUBBER ADHESIVE STRIPE			AR
10	R12354003	R12354003	A0185	.SHIM		EA	60
11	R12354001	R12354001	A0185	.SHIM		EA	18

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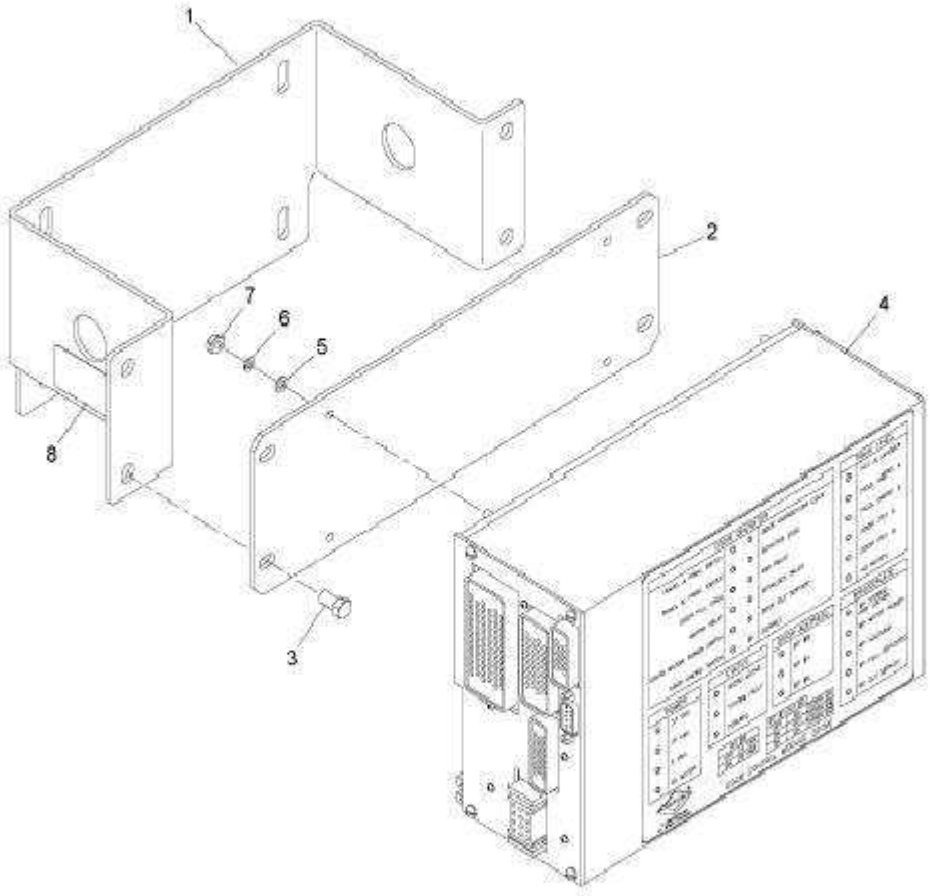


Figure 4-3 Controller and Bracket Assembly, End Door

Section Figure Item	P/N	OEM P/N	OEM Code	Description	MBTA Code	U/M	Qty per Assy
04-003-				DELETED			
1	5973077800			BRACKET		EA	1
2	5972077900			BRACKET		EA	1
3	9761077329			SCR HEX LK FLG 1/4 -20X.50		EA	4
4	5944769701			DOOR CONTROL ASSY.		EA	1
5	84259105			WASHER FL #8 .375X.032 STL ZN		EA	4
6	6712200505			LK WASH SPL NO.8-0.55WX..040THK		EA	4
7	6712300006			NUT HX 8-32STL ZN		EA	4
8	9752194519			LABEL IDENT		EA	1

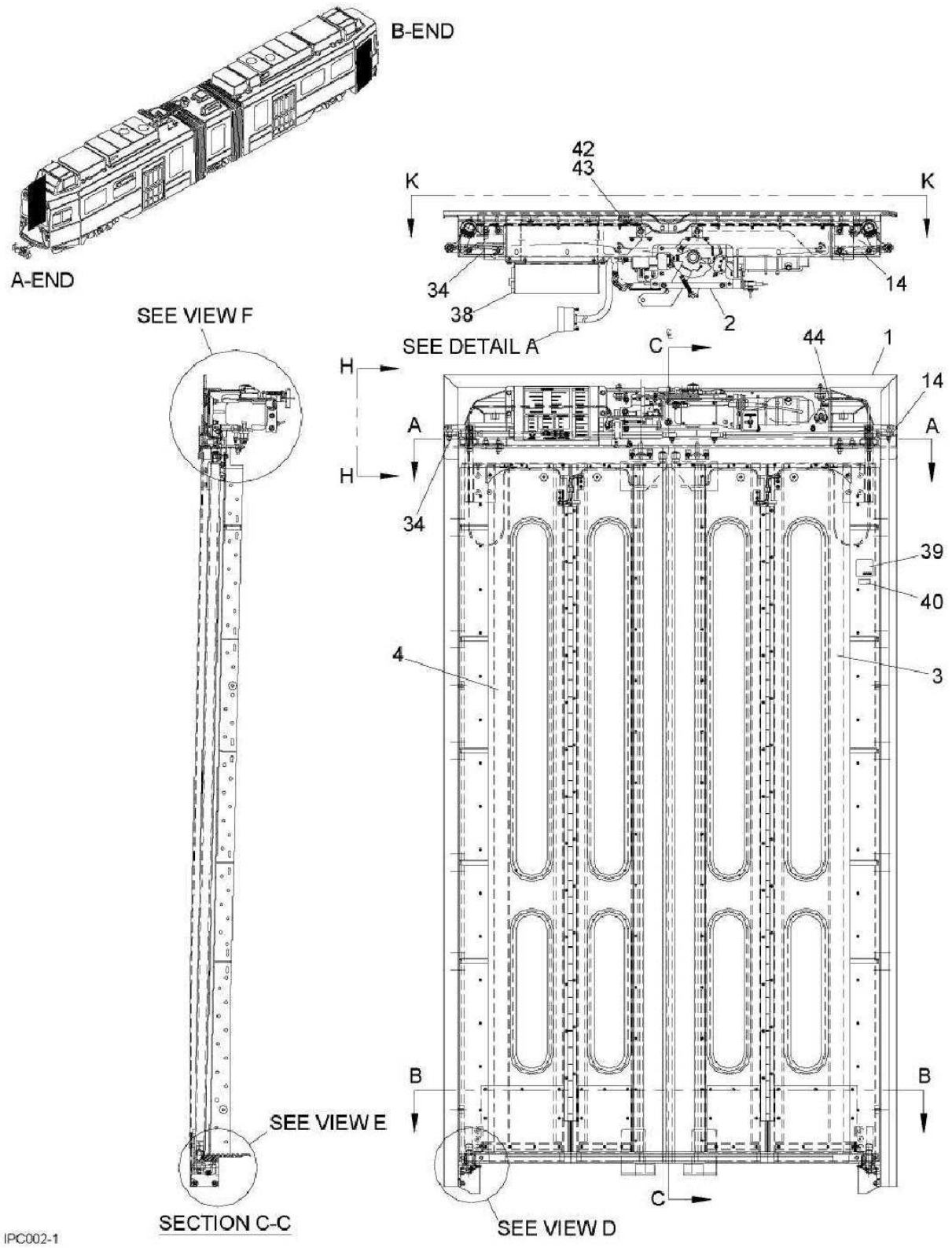
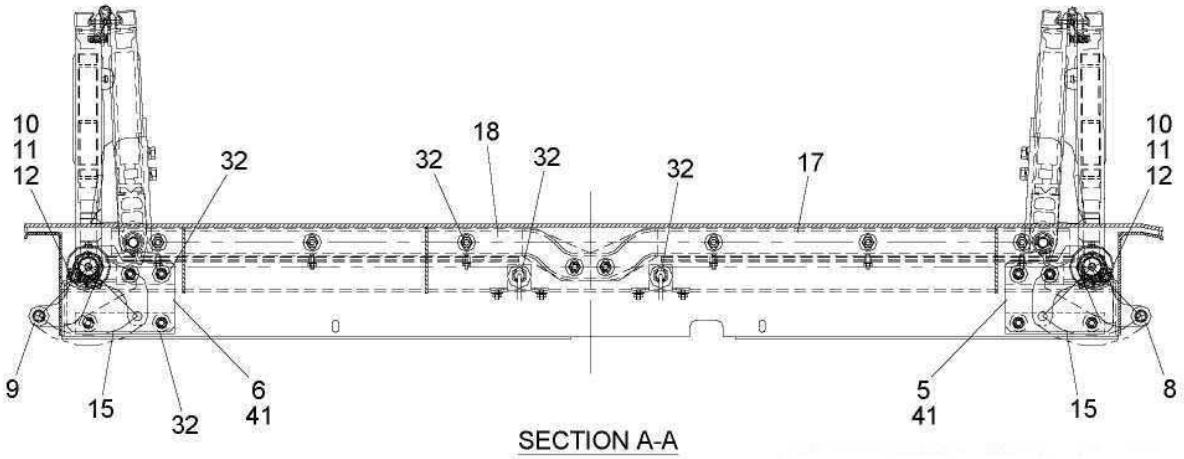
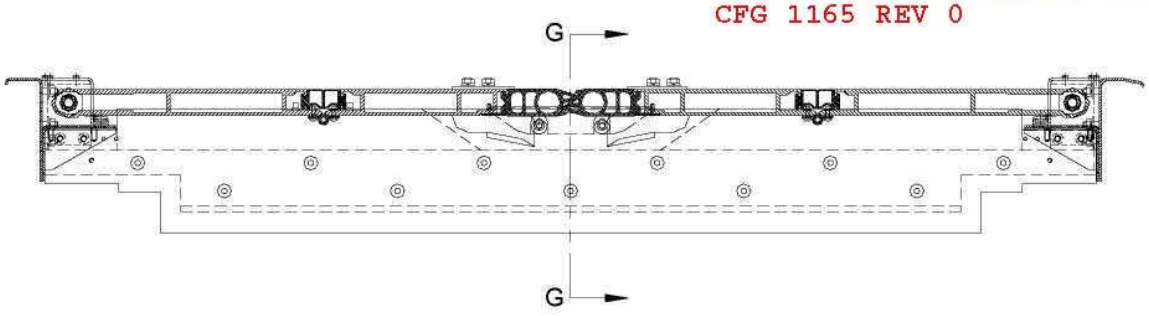


Figure 4-4 Door Module, End Door (Sheet 1 of 3)

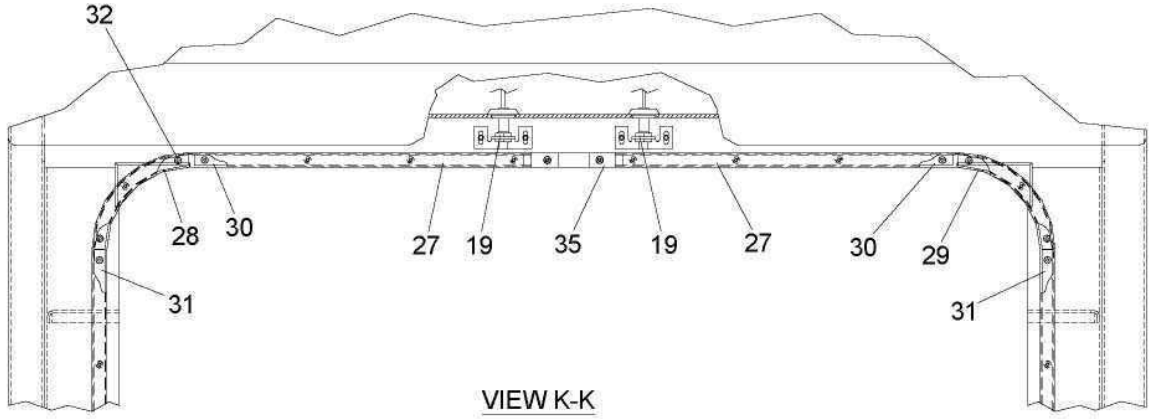


SECTION A-A

ADDED ITEM 45 & 46 AS PER WORK INSTRUCTIONS OF CFG 1165 REV 0



SECTION B-B



VIEW K-K
(DOORS REMOVED FOR CLARITY)

IPC002-2

Figure 4-4 Door Module, End Door (Sheet 2 of 3)

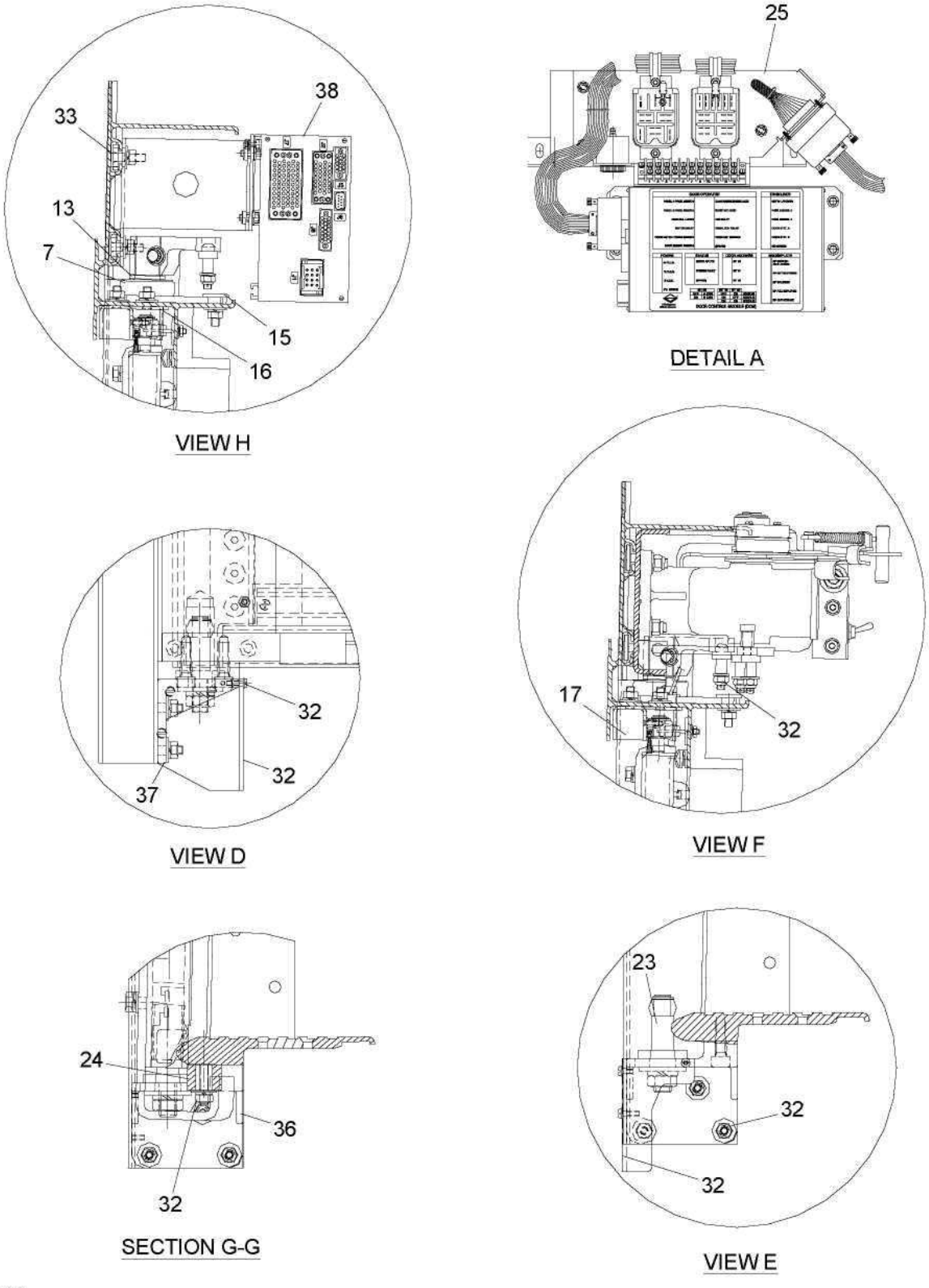


Figure 4-4 Door Module, End Door (Sheet 3 of 3)

Door Module, End Door (Fig. 4-4)

SECTION, FIGURE, & INDEX NUMBER	PART NUMBER	BCF MGMT CODE	MFR CODE	DESCRIPTION	MBTA CODE	U/M	QTY
02-01	59566657			END DOOR MODULE			REF
1	5966114100			FRAME ASSY. MODULE (END)		EA	1
2	5966094101			OPERATOR ASSEMBLY - END (Refer to Figure 2-15 for breakdown)		EA	1
3	5966046800			DOOR PANEL ASSY. RH (Refer to Figure 2-19 for breakdown)		EA	1
4	5966046900			DOOR PANEL ASSY. LH (Refer to Figure 2-20 for breakdown)		EA	1
5	5963624700			PLATE ASSY. BEARING RH		EA	1
6	5963624701			PLATE ASSY. BEARING LH		EA	1
7	5681018000			BEARING, BALL		EA	2
8	5963624600			LEVER ASSY. DOOR SHAFT RH (Refer to Figure 2-29 for breakdown)		EA	1
9	5963624601			LEVER ASSY. DOOR SHAFT LH (Refer to Figure 2-29 for breakdown)		EA	1
10	5601151801			SCREW SPECIAL		EA	2
11	5601151900			WEDGE		EA	2
12	5601152001			WEDGE		EA	2
13	5681030500			SPACER RD 1.01X1.375X.188 STL ZN MACH		EA	2
14	5822613048			ROD ASSEMBLY CONNECTING		EA	1
15	5961624800			PLATE MTG.		EA	2
16	5961624801			PLATE MTG.		EA	2
17	5963100302			CHANNEL ASSY. ROLLER (RH)		EA	1
17	5963133800			ROLLER CHANNEL ASSY. RH (Refer to Figure 2-30 for breakdown)		EA	1
18	5963100303			CHANNEL ASSY. ROLLER (LH)		EA	1
18	5963133801			ROLLER CHANNEL ASSY. LH (Refer to Figure 2-30 for breakdown)		EA	1
19	5962098400			SENSOR ASSY. (Refer to Figure 2-32 for breakdown)		EA	2
21	5963115402			SEAL ASSY. BRUSH (RH)		EA	1
22	5963115403			SEAL ASSY. BRUSH (LH)		EA	1
23	5962115700			PIVOT ASSY. BOTTOM (Refer to Figure 2-38 for breakdown)		EA	2
24	5971090000			WEDGE LOCKING		EA	1

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Door Module, End Door (Fig. 4-4)

SECTION, FIGURE, & INDEX NUMBER	PART NUMBER	BCF MGMT CODE	MFR CODE	DESCRIPTION	MBTA CODE	U/M	QTY
02-01 25	5944769701			DOOR CONTROL ASSY. (Refer to Figure 2-05 for breakdown)		EA	1
25	5974077200			RELAY BRACKET ASSY. (Refer to Figure 2-11 for breakdown)		EA	1
27	5962115500			SEAL DOOR FACE		EA	25
27	5962139700			SEAL-FACE		EA	2
28	5963106100			RETAINER SEAL CORNER RH		EA	1
29	5963106101			RETAINER SEAL CORNER LH		EA	1
30	5963106202			RETAINER SEAL		EA	2
31	5963106203			RETAINER SEAL		EA	2
32	5961115600			KIT HARDWARE		EA	1
33	5962094500			BAR MTG.		EA	4
34	5963152601			ROD ASSY. CONNECTING (Refer to Figure 2-27 for breakdown)		EA	1
35	5961139600			SEAL-TRANSITION		EA	1
36	5973045502			BRACKET PIVOT		EA	1
37	5973045503			BRACKET PIVOT		EA	1
38	5974077700			CONTROLLER & BRACKET ASSY. (Refer to Figure 2-03 for breakdown)		EA	1
39	9752193525			LABEL IDENT.		EA	1
40	9752192665			LABEL IDENT.		EA	1
41	5982050900			SEAL-BEARING BRACKET		EA	2
42	1851026800			MOUNT ADHESIVE BACKED		EA	1
43	5621647605			TIE CABLE S/LOCK .095X8.00 NYL WHT		EA	1
44	97510118-04			SLEEVING FLEXIBLE		EA	1
45	R13354116	R13354116	A0185	FILTER ASSEMBLY		EA	1
46	FQN14M25X03D			FAST ON CONNECTOR MALE, 16 AWG, 1/4", insulated, Burndy FQN14M25X03D		EA	2

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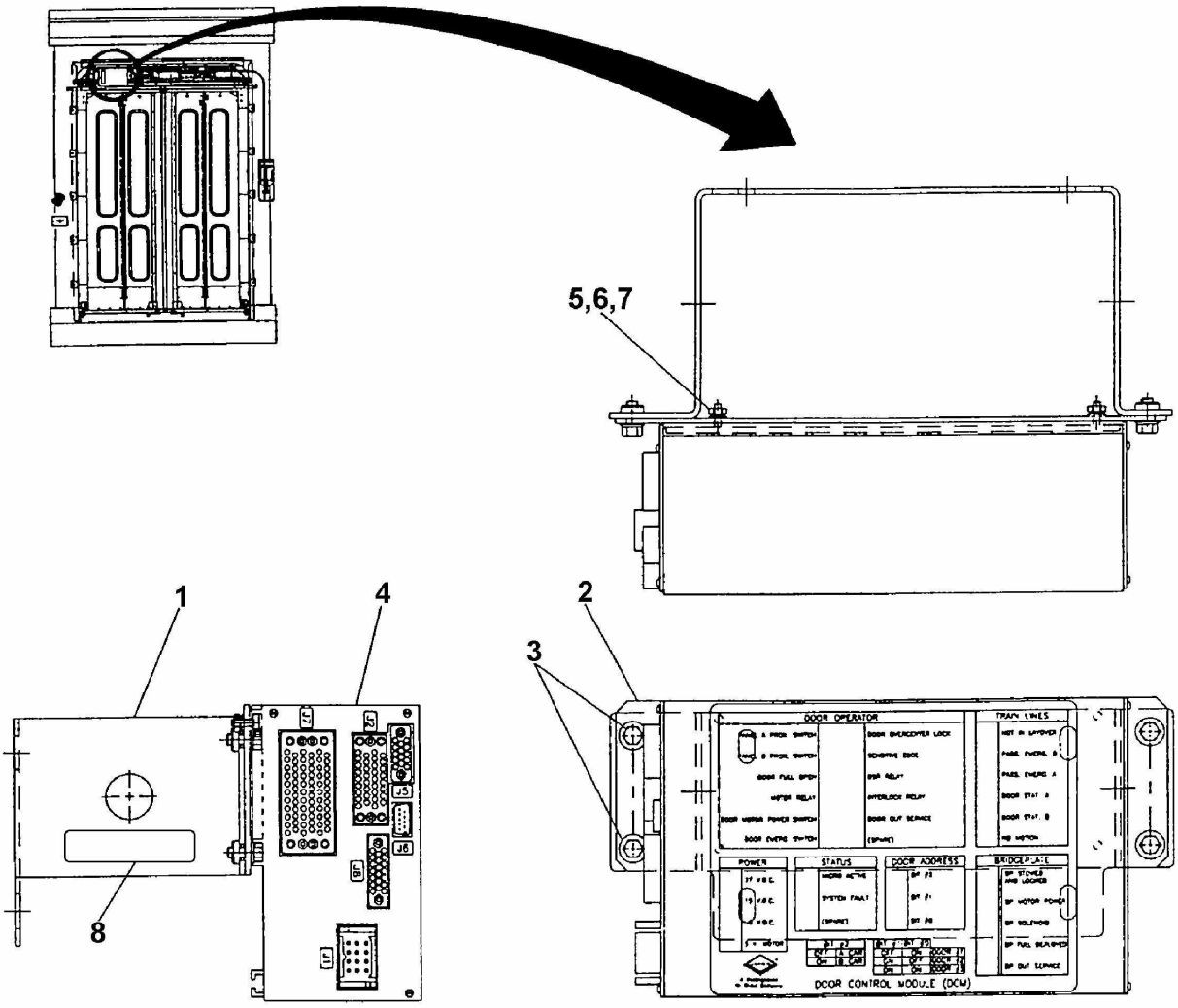


Figure 4-5 Controller And Bracket Assembly

Controller And Bracket Assembly (Fig. 4-5)

Section Figure Item	P/N	OEM P/N	OEM Code	Description	MBTA Code	U/M	Qty per Assy
04-005-	59740777	59740777	E0017	CONTROLLER AND BRACKET ASSEMBLY- SEE Figure 4-4 FOR NHA		EA	1
1	59730778	59730778	E0017	.BRACKET		EA	1
2	59720779	59720779	E0017	.BRACKET		EA	1
3	97610773-29	97610773-29	E0017	.SCREW, HEX LK FLG - 1/4-20 X - ATT.PT 0.50 - STL ZNP		EA	4
4	59447697-01	59447697-01	E0017	.DOOR CONTROLLER ASSY, END DOOR - SEE Figure 4-6 FOR DETAIL		EA	1
5	67123000-06	67123000-06	E0017	.NUT, HEX - NO 8-32 - STL ZNP - ATT.PT		EA	4
6	67122005-05	67122005-05	E0017	.LOCKWASHER, SPLIT - NO 8, - ATT.PT 0.055 W X 0.040 THK - STL ZNP		EA	4
7	67122110-05	67122110-05	E0017	.WASHER, PL - NO 8, 0.375 OD - ATT.PT X 0.032 THK - STL ZNP		EA	4
8	97521945-19	97521945-19	E0017	.LABEL, IDENTIFICATION		EA	1

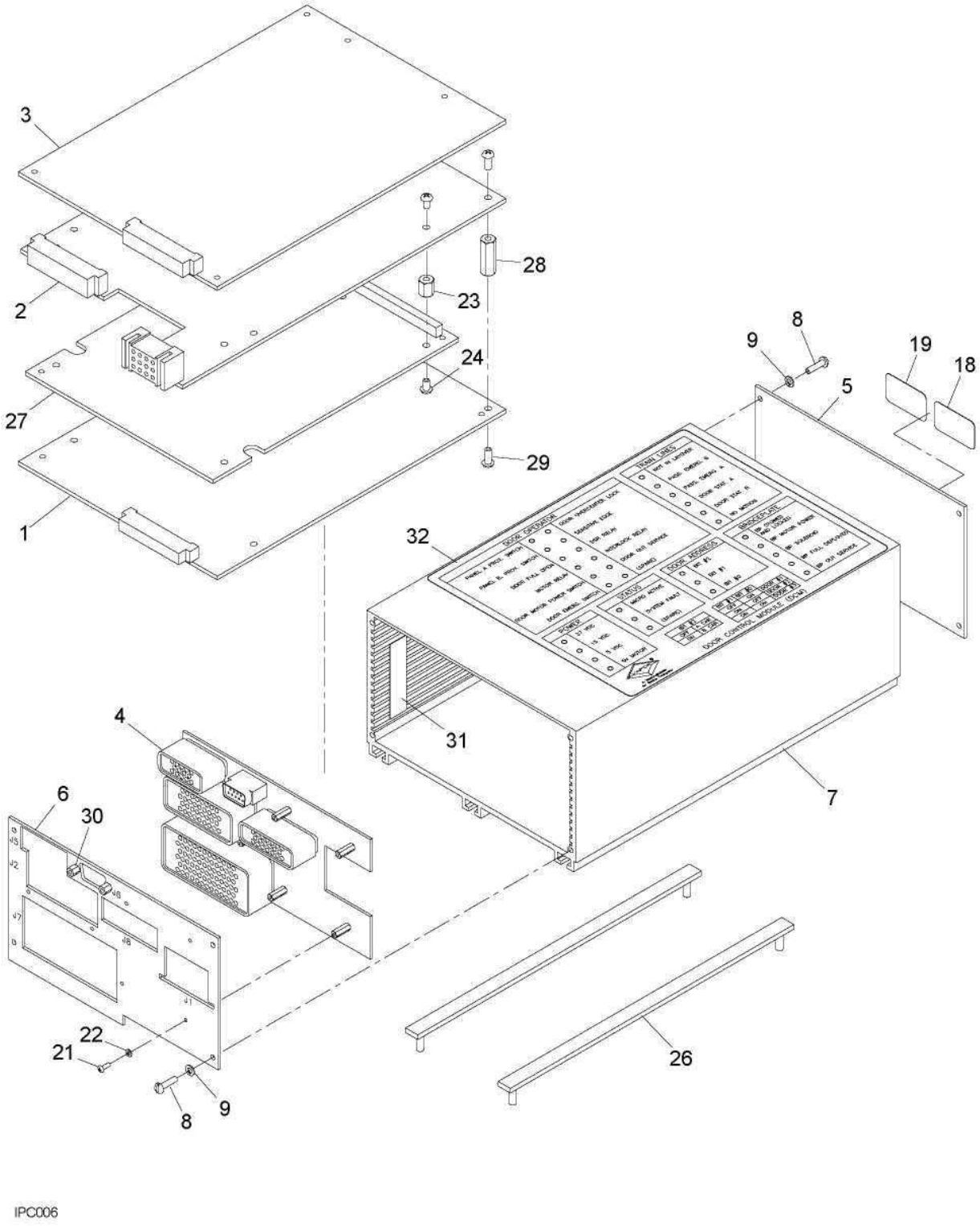
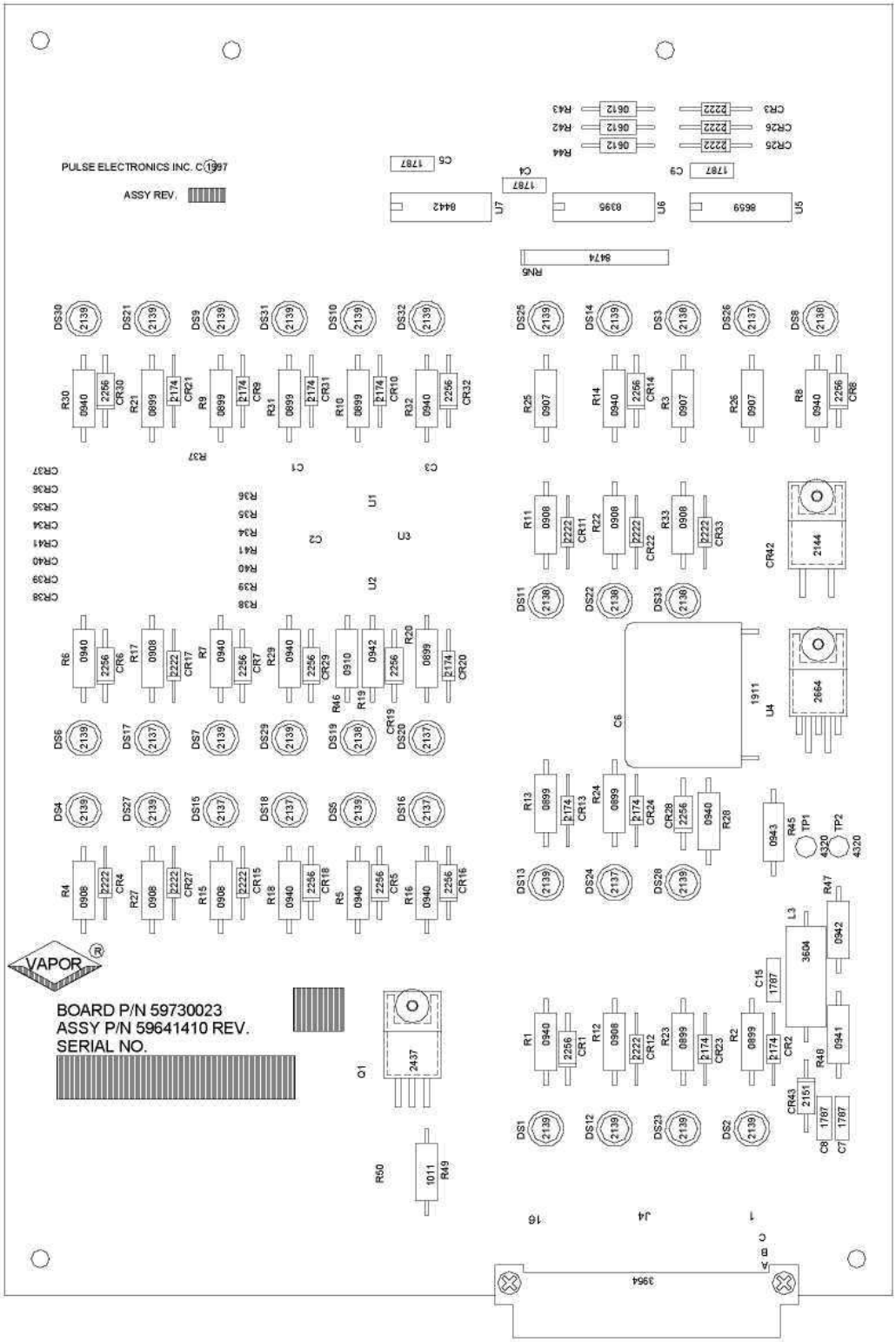


Figure 4-6 Door Controller Assy, End Door

Door Controller Assy, End Door (Fig. 4-6)

SECTION, FIGURE, & INDEX NUMBER	PART NUMBER	BCF MGMT CODE	MFR CODE	DESCRIPTION	MBTA CODE	U/M	QTY
02-05	5944769701			CONTROLLER, END DOOR (Refer to Item 4, Figure 2-3 for NHA)			REF
1	5964141000			BOARD ASSY. MICRO PROCESS. (DCM)		EA	1
2	5964141100			BOARD ASSY. DRIVER (DCM)		EA	1
3	5964141200			BOARD ASSY. LED (DCM)		EA	1
4	5964141300			BOARD ASSY. INTERFACE (DCM)		EA	1
5	5982008800			END PLATE & PAD ASSY.		EA	1
6	5982009100			END PLATE & SCREEN ASSY.		EA	1
7	5983008700			BOX & LABEL ASSY.		EA	1
8	6712100227			SCR PAN HD REC 4-40 X.500LG		EA	8
9	6712200100			LK WASH EXT NO.4		EA	8
10	97W259 (6711000701)			ADHESIVE SCR LK ANAEROBIC		EA	0
11	PPN 4334			RIBBON CABLE 2" WITH RECEPTACLES		EA	2
18	97521929-39			HARDWARE REVISION LABEL		EA	1
19	97521929-41			SOFTWARE REVISION LABEL		EA	1
21	6712100202			SCR PAN HD REC 2-56X.250LG		EA	6
22	67122005			LOCKWASHER #2-0.035"Wx0.020"THK		EA	6
23	1611609153			POST MTG., 6-32X1/4"X0.375 F-F		EA	5
24	6712100255			SCR PAN HD REC 6-32 X.250LG		EA	10
26	5962131702			PAD MOUNTING		EA	2
27	5984017200			INPUT ADAPTER PCB ASSY.		EA	1
28	1611609174			POST MTG.		EA	6
29	6712100257			SCR PAN HD REC 6-32 X.375LG		EA	8
30	9523			SCR PAN HD SLTD 4-40X.250" LG		EA	2
31	200320301			BARCODE FOR DCM		EA	1
32	PPN 4424			NAMEPLATE FOR 59447697-03		EA	1



IPC008

COMPONENT SIDE VIEW

Figure 4-7 Led Printed Circuit Board Assy (Dcm)

Led Printed Circuit Board Assy (Dcm) (Fig. 4-7)

Section Figure Item	P/N	OEM P/N	OEM Code	Description	MBTA Code	U/M	Qty per Assy
04-007-	59641412	59641412	E0017	LED PRINTED CIRCUIT BOARD ASSY (DCM) - SEE Figure 4-6, Figure 4-26 FOR NHA		EA	1
1		COMMERCIAL	Z9009	.SPACERS, LED - STD 0.180 WHT (0.18 INCHES LG.) - (N.I.)		EA	31
C01	PRE110X7R103K-	PRE110X7R103K-100V	B0058	.CAPACITOR - 0.01 æF, 100 V, RADIAL LEAD		EA	1
C02	PRE110X7R103K-	PRE110X7R103K-100V	B0058	.CAPACITOR - 0.01 æF, 100 V, RADIAL LEAD		EA	1
C03	PRE110X7R103K-	PRE110X7R103K-100V	B0058	.CAPACITOR - 0.01 æF, 100 V, RADIAL LEAD		EA	1
C04	PRE110X7R103K-	PRE110X7R103K-100V	B0058	.CAPACITOR - 0.01 æF, 100 V, RADIAL LEAD		EA	1
C05	PRE110X7R103K-	PRE110X7R103K-100V	B0058	.CAPACITOR - 0.01 æF, 100 V, RADIAL LEAD		EA	1
D01	HLMP-4740	HLMP-4740	B0040	.GREEN LED, HIGH EFFICIENCY		EA	1
D02	HLMP-4740	HLMP-4740	B0040	.GREEN LED, HIGH EFFICIENCY		EA	1
D03	HLMP-4719	HLMP-4719	B0040	.AMBER LED, HIGH EFFICIENCY		EA	1
D04	HLMP-4740	HLMP-4740	B0040	.GREEN LED, HIGH EFFICIENCY		EA	1
D05	HLMP-4740	HLMP-4740	B0040	.GREEN LED, HIGH EFFICIENCY		EA	1
D06	HLMP-4740	HLMP-4740	B0040	.GREEN LED, HIGH EFFICIENCY		EA	1
D07	HLMP-4740	HLMP-4740	B0040	.GREEN LED, HIGH EFFICIENCY		EA	1
D08	HLMP-4719	HLMP-4719	B0040	.AMBER LED, HIGH EFFICIENCY		EA	1
D09	HLMP-4740	HLMP-4740	B0040	.GREEN LED, HIGH EFFICIENCY		EA	1
D10	HLMP-4740	HLMP-4740	B0040	.GREEN LED, HIGH EFFICIENCY		EA	1
D11	HLMP-4719	HLMP-4719	B0040	.AMBER LED, HIGH EFFICIENCY		EA	1
D12	HLMP-4740	HLMP-4740	B0040	.GREEN LED, HIGH EFFICIENCY		EA	1
D13	HLMP-4740	HLMP-4740	B0040	.GREEN LED, HIGH EFFICIENCY		EA	1

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Led Printed Circuit Board Assy (Dcm) (Fig. 4-7)

Section Figure Item	P/N	OEM P/N	OEM Code	Description	MBTA Code	U/M	Qty per Assy
04-007- D14	HLMP-4740	HLMP-4740	B0040	.GREEN LED, HIGH EFFICIENCY		EA	1
D15	HLMP-4700	HLMP-4700	B0040	.RED LED, HIGH EFFICIENCY		EA	1
D16	HLMP-4700	HLMP-4700	B0040	.RED LED, HIGH EFFICIENCY		EA	1
D17	HLMP-4700	HLMP-4700	B0040	.RED LED, HIGH EFFICIENCY		EA	1
D18	HLMP-4700	HLMP-4700	B0040	.RED LED, HIGH EFFICIENCY		EA	1
D19	HLMP-4719	HLMP-4719	B0040	.AMBER LED, HIGH EFFICIENCY		EA	1
D21	HLMP-4740	HLMP-4740	B0040	.GREEN LED, HIGH EFFICIENCY		EA	1
D22	HLMP-4719	HLMP-4719	B0040	.AMBER LED, HIGH EFFICIENCY		EA	1
D23	HLMP-4740	HLMP-4740	B0040	.GREEN LED, HIGH EFFICIENCY		EA	1
D24	HLMP-4700	HLMP-4700	B0040	.RED LED, HIGH EFFICIENCY		EA	1
D25	HLMP-4740	HLMP-4740	B0040	.GREEN LED, HIGH EFFICIENCY		EA	1
D26	HLMP-4700	HLMP-4700	B0040	.RED LED, HIGH EFFICIENCY		EA	1
D27	HLMP-4740	HLMP-4740	B0040	.GREEN LED, HIGH EFFICIENCY		EA	1
D29	HLMP-4740	HLMP-4740	B0040	.GREEN LED, HIGH EFFICIENCY		EA	1
D30	HLMP-4740	HLMP-4740	B0040	.GREEN LED, HIGH EFFICIENCY		EA	1
D31	HLMP-4740	HLMP-4740	B0040	.GREEN LED, HIGH EFFICIENCY		EA	1
D32	HLMP-4750	HLMP-4750	B0040	.GREEN LED, HIGH EFFICIENCY		EA	1
D33	HLMP-4719	HLMP-4719	B0040	.AMBER LED, HIGH EFFICIENCY		EA	1
J04	FHC-048-021-2	FHC-048-021-2	B0009	.CONNECTOR, 90 DEG, TYPE C, HALF DIN		EA	1
Q01	2N3904	2N3904	E0081	.NPT TRANSISTOR, 29-05 CASE		EA	1
R01		5.6K OHM, 1/2 WATT	Z9009	.RESISTOR, 5.6K OHM, 1/2 WATT, CARBON		EA	1
R02		560 OHM, 1/2 WATT	Z9009	.RESISTOR, 560 OHM, 1/2 WATT, CARBON		EA	1
R03		3.6K OHM, 1/2 WATT	Z9009	.RESISTOR, 3.6K OHM, 1/2 WATT, CARBON		EA	1
R04		3.6K OHM, 1/2 WATT	Z9009	.RESISTOR, 3.6K OHM, 1/2 WATT, CARBON		EA	1
R05		5.6K OHM, 1/2 WATT	Z9009	.RESISTOR, 5.6K OHM, 1/2 WATT, CARBON		EA	1

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Led Printed Circuit Board Assy (Dcm) (Fig. 4-7)

Section Figure Item	P/N	OEM P/N	OEM Code	Description	MBTA Code	U/M	Qty per Assy
04-007- R06		5.6K OHM, 1/2 WATT	Z9009	.RESISTOR, 5.6K OHM, 1/2 WATT, CARBON		EA	1
R07		5.6K OHM, 1/2 WATT	Z9009	.RESISTOR, 5.6K OHM, 1/2 WATT, CARBON		EA	1
R08		5.6K OHM, 1/2 WATT	Z9009	.RESISTOR, 5.6K OHM, 1/2 WATT, CARBON		EA	1
R09		560 OHM, 1/2 WATT	Z9009	.RESISTOR, 560 OHM, 1/2 WATT, CARBON		EA	1
R10		560 OHM, 1/2 WATT	Z9009	.RESISTOR, 560 OHM, 1/2 WATT, CARBON		EA	1
R11		3.6K OHM, 1/2 WATT	Z9009	.RESISTOR, 3.6K OHM, 1/2 WATT, CARBON		EA	1
R12		3.6K OHM, 1/2 WATT	Z9009	.RESISTOR, 3.6K OHM, 1/2 WATT, CARBON		EA	1
R13		560 OHM, 1/2 WATT	Z9009	.RESISTOR, 560 OHM, 1/2 WATT, CARBON		EA	1
R14		5.6K OHM, 1/2 WATT	Z9009	.RESISTOR, 5.6K OHM, 1/2 WATT, CARBON		EA	1
R15		3.6K OHM, 1/2 WATT	Z9009	.RESISTOR, 3.6K OHM, 1/2 WATT, CARBON		EA	1
R16		5.6K OHM, 1/2 WATT	Z9009	.RESISTOR, 5.6K OHM, 1/2 WATT, CARBON		EA	1
R17		3.6K OHM, 1/2 WATT	Z9009	.RESISTOR, 3.6K OHM, 1/2 WATT, CARBON		EA	1
R18		5.6K OHM, 1/2 WATT	Z9009	.RESISTOR, 5.6K OHM, 1/2 WATT, CARBON		EA	1
R19		5.6K OHM, 1/2 WATT	Z9009	.RESISTOR, 5.6K OHM, 1/2 WATT, CARBON		EA	1
R20		560 OHM, 1/2 WATT	Z9009	.RESISTOR, 560 OHM, 1/2 WATT, CARBON		EA	1
R21		560 OHM, 1/2 WATT	Z9009	.RESISTOR, 560 OHM, 1/2 WATT, CARBON		EA	1
R22		3.6K OHM, 1/2 WATT	Z9009	.RESISTOR, 3.6K OHM, 1/2 WATT, CARBON		EA	1
R23		560 OHM, 1/2 WATT	Z9009	.RESISTOR, 560 OHM, 1/2 WATT, CARBON		EA	1
R24		560 OHM, 1/2 WATT	Z9009	.RESISTOR, 560 OHM, 1/2 WATT, CARBON		EA	1
R25		3.6K OHM, 1/2 WATT	Z9009	.RESISTOR, 3.6K OHM, 1/2 WATT, CARBON		EA	1

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Led Printed Circuit Board Assy (Dcm) (Fig. 4-7)

Section Figure Item	P/N	OEM P/N	OEM Code	Description	MBTA Code	U/M	Qty per Assy
04-007-R26		3.6K OHM, 1/2 WATT	Z9009	.RESISTOR, 3.6K OHM, 1/2 WATT, CARBON		EA	1
R27		3.6K OHM, 1/2 WATT	Z9009	.RESISTOR, 3.6K OHM, 1/2 WATT, CARBON		EA	1
R29		5.6K OHM, 1/2 WATT	Z9009	.RESISTOR, 5.6K OHM, 1/2 WATT, CARBON		EA	1
R30		5.6K OHM, 1/2 WATT	Z9009	.RESISTOR, 5.6K OHM, 1/2 WATT, CARBON		EA	1
R31		560 OHM, 1/2 WATT	Z9009	.RESISTOR, 560 OHM, 1/2 WATT, CARBON		EA	1
R32		5.6K OHM, 1/2 WATT	Z9009	.RESISTOR, 5.6K OHM, 1/2 WATT, CARBON		EA	1
R33		3.6K OHM, 1/2 WATT	Z9009	.RESISTOR, 3.6K OHM, 1/2 WATT, CARBON		EA	1
R34		16K OHM ñ5%, 1/2 WATT	Z9009	.RESISTOR, 16K OHM ñ5%, 1/2 WATT, CARBON		EA	1
R35		16K OHM ñ5%, 1/2 WATT	Z9009	.RESISTOR, 16K OHM ñ5%, 1/2 WATT, CARBON		EA	1
R36		16K OHM ñ5%, 1/2 WATT	Z9009	.RESISTOR, 16K OHM ñ5%, 1/2 WATT, CARBON		EA	1
R37		16K OHM ñ5%, 1/2 WATT	Z9009	.RESISTOR, 16K OHM ñ5%, 1/2 WATT, CARBON		EA	1
R38		16K OHM ñ5%, 1/2 WATT	Z9009	.RESISTOR, 16K OHM ñ5%, 1/2 WATT, CARBON		EA	1
R39		16K OHM ñ5%, 1/2 WATT	Z9009	.RESISTOR, 16K OHM ñ5%, 1/2 WATT, CARBON		EA	1
R40		16K OHM ñ5%, 1/2 WATT	Z9009	.RESISTOR, 16K OHM ñ5%, 1/2 WATT, CARBON		EA	1
R41		16K OHM ñ5%, 1/2 WATT	Z9009	.RESISTOR, 16K OHM ñ5%, 1/2 WATT, CARBON		EA	1
R42		3.6K OHM, 1/2 WATT	Z9009	.RESISTOR, 3.6K OHM, 1/2 WATT, CARBON		EA	1
R43		3.6K OHM, 1/2 WATT	Z9009	.RESISTOR, 3.6K OHM, 1/2 WATT, CARBON		EA	1
R44		3.6K OHM, 1/2 WATT	Z9009	.RESISTOR, 3.6K OHM, 1/2 WATT, CARBON		EA	1
U01	74HC00N	74HC00N	E0198	.QUAD 2 INPUT NAND GATE, DIP		EA	1
U02	74HC00N	74HC00N	E0198	.QUAD 2 INPUT NAND GATE, DIP		EA	1

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Led Printed Circuit Board Assy (Dcm) (Fig. 4-7)

Section Figure Item	P/N	OEM P/N	OEM Code	Description	MBTA Code	U/M	Qty per Assy
04-007- U03	74HC09N	74HC09N	E0198	.QUAD 2 INPUT AND GATE WITH OPEN COLLECTOR OUTPUTS, DIP		EA	1
U04	MSP10A-01-393G	MSP10A-01-393G	E0194	.RESISTOR NETWORK - 39K OHM, 1/8 WATT, 10 PIN BUSSED, SINGLE IN-LINE PIN PACKAGE		EA	1
U05	MSP10A-01-393G	MSP10A-01-393G	E0194	.RESISTOR NETWORK - 39K OHM, 1/8 WATT, 10 PIN BUSSED, SINGLE IN-LINE PIN PACKAGE		EA	1
U06	74HC00N	74HC00N	E0198	.QUAD 2 INPUT NAND GATE, DIP		EA	1
U07	74HC04N	74HC04N	E0198	.HEX INVERTER, DIP		EA	1
Z01	1N5252B	1N5252B	E0081	.ZENER DIODE, 500 MILLIWATT ñ5%, 24V		EA	1
Z02	1N4679	1N4679	E0081	.ZENER DIODE, 500 MILLIWATT ñ5%, 2.0V		EA	1
Z03	1N5232B	1N5232B	E0081	.ZENER DIODE, 500 MILLIWATT ñ5%, 5.6V		EA	1
Z04	1N5232B	1N5232B	E0081	.ZENER DIODE, 500 MILLIWATT ñ5%, 5.6V		EA	1
Z05	1N5252B	1N5252B	E0081	.ZENER DIODE, 500 MILLIWATT ñ5%, 24V		EA	1
Z06	1N5252B	1N5252B	E0081	.ZENER DIODE, 500 MILLIWATT ñ5%, 24V		EA	1
Z07	1N5252B	1N5252B	E0081	.ZENER DIODE, 500 MILLIWATT ñ5%, 24V		EA	1
Z08	1N5252B	1N5252B	E0081	.ZENER DIODE, 500 MILLIWATT ñ5%, 24V		EA	1
Z09	1N4679	1N4679	E0081	.ZENER DIODE, 500 MILLIWATT ñ5%, 2.0V		EA	1
Z10	1N4679	1N4679	E0081	.ZENER DIODE, 500 MILLIWATT ñ5%, 2.0V		EA	1
Z11	1N5232B	1N5232B	E0081	.ZENER DIODE, 500 MILLIWATT ñ5%, 5.6V		EA	1
Z12	1N5232B	1N5232B	E0081	.ZENER DIODE, 500 MILLIWATT ñ5%, 5.6V		EA	1
Z13	1N4679	1N4679	E0081	.ZENER DIODE, 500 MILLIWATT ñ5%, 2.0V		EA	1
Z14	1N5252B	1N5252B	E0081	.ZENER DIODE, 500 MILLIWATT ñ5%, 24V		EA	1
Z15	1N5232B	1N5232B	E0081	.ZENER DIODE, 500 MILLIWATT ñ5%, 5.6V		EA	1
Z16	1N5252B	1N5252B	E0081	.ZENER DIODE, 500 MILLIWATT ñ5%, 24V		EA	1
Z17	1N5232B	1N5232B	E0081	.ZENER DIODE, 500 MILLIWATT ñ5%, 5.6V		EA	1

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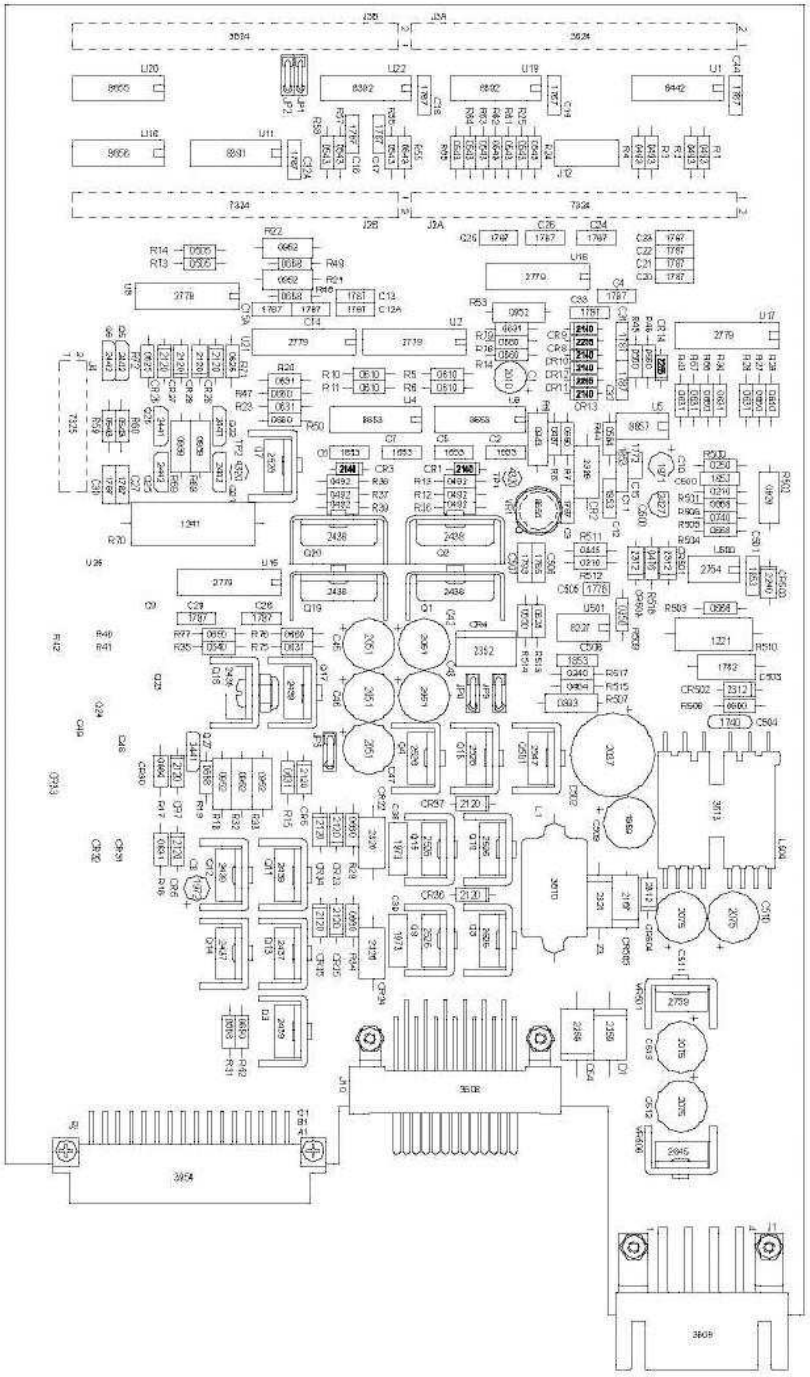
Led Printed Circuit Board Assy (Dcm) (Fig. 4-7)

Section Figure Item	P/N	OEM P/N	OEM Code	Description	MBTA Code	U/M	Qty per Assy
04-007- Z18	1N5252B	1N5252B	E0081	.ZENER DIODE, 500 MILLIWATT ñ5%, 24V		EA	1
Z19	1N5252B	1N5252B	E0081	.ZENER DIODE, 500 MILLIWATT ñ5%, 24V		EA	1
Z21	1N4679	1N4679	E0081	.ZENER DIODE, 500 MILLIWATT ñ5%, 2.0V		EA	1
Z22	1N5232B	1N5232B	E0081	.ZENER DIODE, 500 MILLIWATT ñ5%, 5.6V		EA	1
Z23	1N4679	1N4679	E0081	.ZENER DIODE, 500 MILLIWATT ñ5%, 2.0V		EA	1
Z24	1N4679	1N4679	E0081	.ZENER DIODE, 500 MILLIWATT ñ5%, 2.0V		EA	1
Z25	1N5232B	1N5232B	E0081	.ZENER DIODE, 500 MILLIWATT ñ5%, 5.6V		EA	1
Z26	1N5232B	1N5232B	E0081	.ZENER DIODE, 500 MILLIWATT ñ5%, 5.6V		EA	1
Z27	1N5232B	1N5232B	E0081	.ZENER DIODE, 500 MILLIWATT ñ5%, 5.6V		EA	1
Z29	1N5252B	1N5252B	E0081	.ZENER DIODE, 500 MILLIWATT ñ5%, 24V		EA	1
Z30	1N5252B	1N5252B	E0081	.ZENER DIODE, 500 MILLIWATT ñ5%, 24V		EA	1
Z31	1N4679	1N4679	E0081	.ZENER DIODE, 500 MILLIWATT ñ5%, 2.0V		EA	1
Z32	1N5252B	1N5252B	E0081	.ZENER DIODE, 500 MILLIWATT ñ5%, 24V		EA	1
Z33	1N5232B	1N5232B	E0081	.ZENER DIODE, 500 MILLIWATT ñ5%, 5.6V		EA	1
Z34	1N4732B	1N4732B	E0081	.ZENER DIODE, 500 MILLIWATT ñ5%, 4.7V		EA	1
Z35	1N4732B	1N4732B	E0081	.ZENER DIODE, 500 MILLIWATT ñ5%, 4.7V		EA	1
Z36	1N4732B	1N4732B	E0081	.ZENER DIODE, 500 MILLIWATT ñ5%, 4.7V		EA	1
Z37	1N4732B	1N4732B	E0081	.ZENER DIODE, 500 MILLIWATT ñ5%, 4.7V		EA	1
Z38	1N4732B	1N4732B	E0081	.ZENER DIODE, 500 MILLIWATT ñ5%, 4.7V		EA	1
Z39	1N4732B	1N4732B	E0081	.ZENER DIODE, 500 MILLIWATT ñ5%, 4.7V		EA	1
Z40	1N4732B	1N4732B	E0081	.ZENER DIODE, 500 MILLIWATT ñ5%, 4.7V		EA	1
Z41	1N4732B	1N4732B	E0081	.ZENER DIODE, 500 MILLIWATT ñ5%, 4.7V		EA	1



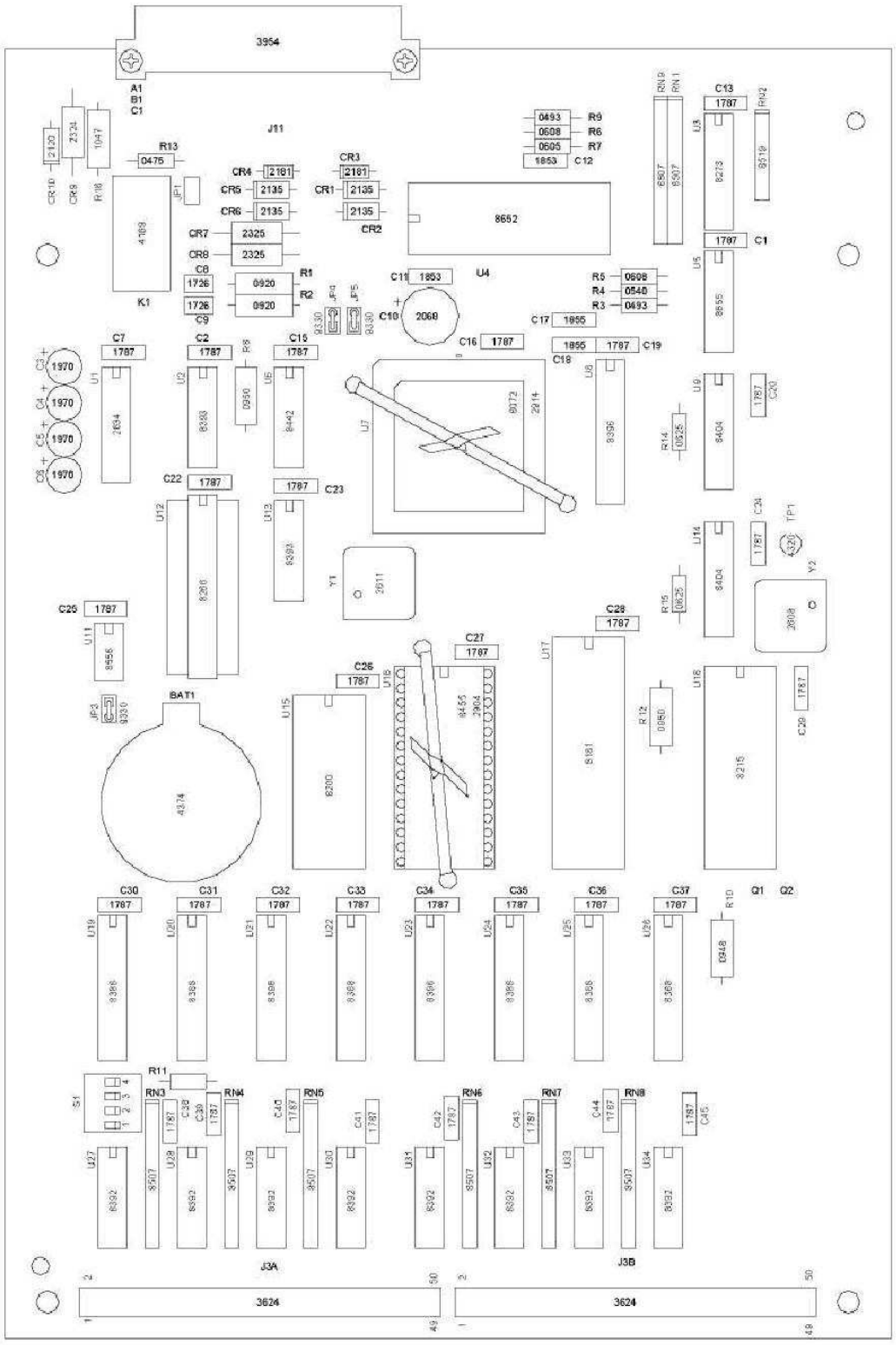
COMPONENT SIDE VIEW

IPC009

Figure 4-8 Driver Printed Circuit Board Assy (Dcm)

Driver Printed Circuit Board Assy (Dcm) (Fig. 4-8)

Section Figure Item	P/N	OEM P/N	OEM Code	Description	MBTA Code	U/M	Qty per Assy
04-008-	59641411	59641411	E0017	DRIVER PRINTED CIRCUIT BOARD ASSY (DCM) - SEE Figure 4-6, Figure 4-28 FOR NHA		EA	1
*				* THIS PARTS LIST IS NOT YET AVAILABLE			



COMPONENT SIDE

IPC010

Figure 4-9 Microprocessor Printed Circuit Board Assy (Dcm)

Microprocessor Printed Circuit Board Assy (Dcm) (Fig. 4-9)

Section Figure Item	P/N	OEM P/N	OEM Code	Description	MBTA Code	U/M	Qty per Assy
04-009-	59641410	59641410	E0017	MICROPROCESSOR PRINTED CIRCUIT BOARD ASSY (DCM) - SEE Figure 4-6, Figure 4-28 FOR NHA		EA	1
BAT1	BR2330-1 HE-P19	BR2330-1 HE-P198-ND	B0076	.BATTERY		EA	1
C01	UVX1C105MPA	UVX1C105MPA	B0033	.CAPACITOR, ELECTROLYTIC, 1 æF, 16V		EA	1
C02	1C10Z5U104M100B	1C10Z5U104M100B	E0190	.CAPACITOR, BYPASS, 0.01 æF, 100V		EA	1
C03	UVX1C105MPA	UVX1C105MPA	B0033	.CAPACITOR, ELECTROLYTIC, 1 æF, 16V		EA	1
C04	UVX1C105MPA	UVX1C105MPA	B0033	.CAPACITOR, ELECTROLYTIC, 1 æF, 16V		EA	1
C05	UVX1C105MPA	UVX1C105MPA	B0033	.CAPACITOR, ELECTROLYTIC, 1 æF, 16V		EA	1
C06	UVX1C105MPA	UVX1C105MPA	B0033	.CAPACITOR, ELECTROLYTIC, 1 æF, 16V		EA	1
C07	1C10Z5U104M100B	1C10Z5U104M100B	E0190	.CAPACITOR, BYPASS, 0.01 æF, 100V		EA	1
C08	1C10C0G222J100B	1C10C0G222J100B	E0190	.CAPACITOR, CERAMIC 2200 PICOFARAD, ñ5%, 100V		EA	1
C09	1C10C0G222J100B	1C10C0G222J100B	E0190	.CAPACITOR, CERAMIC 2200 PICOFARAD, ñ5%, 100V		EA	1
C10	1C10C0G222J100B	1C10C0G222J100B	E0190	.CAPACITOR, CERAMIC 2200 PICOFARAD, ñ5%, 100V		EA	1
C11	1C10C0G222J100B	1C10C0G222J100B	E0190	.CAPACITOR, CERAMIC 2200 PICOFARAD, ñ5%, 100V		EA	1
C12	1C10Z5U104M100B	1C10Z5U104M100B	E0190	.CAPACITOR, BYPASS, 0.01 æF, 100V		EA	1
C13	1C10Z5U104M100B	1C10Z5U104M100B	E0190	.CAPACITOR, BYPASS, 0.01 æF, 100V		EA	1
C14	1C10Z5U104M100B	1C10Z5U104M100B	E0190	.CAPACITOR, BYPASS, 0.01 æF, 100V		EA	1
C15	1C10Z5U104M100B	1C10Z5U104M100B	E0190	.CAPACITOR, BYPASS, 0.01 æF, 100V		EA	1

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Microprocessor Printed Circuit Board Assy (Dcm) (Fig. 4-9)

Section Figure Item	P/N	OEM P/N	OEM Code	Description	MBTA Code	U/M	Qty per Assy
04-009-C16	1C10Z5U104M100B	1C10Z5U104M100B	E0190	.CAPACITOR, BYPASS, 0.01 æF, 100V		EA	1
C17	PRE113Z5U105N05	PRE113Z5U105N050V	B0058	.CAPACITOR - 1 æF, 50V, CERAMIC		EA	1
C18	UMA1H010MDA	UMA1H010MDA	B0044	.CAPACITOR, ELECTROLYTIC, 1 æF, 50V		EA	1
C19	1C10Z5U104M100B	1C10Z5U104M100B	E0190	.CAPACITOR, BYPASS, 0.01 æF, 100V		EA	1
C20	1C10Z5U104M100B	1C10Z5U104M100B	E0190	.CAPACITOR, BYPASS, 0.01 æF, 100V		EA	1
C21	1C10Z5U104M100B	1C10Z5U104M100B	E0190	.CAPACITOR, BYPASS, 0.01 æF, 100V		EA	1
C22	1C10Z5U104M100B	1C10Z5U104M100B	E0190	.CAPACITOR, BYPASS, 0.01 æF, 100V		EA	1
C23	1C10Z5U104M100B	1C10Z5U104M100B	E0190	.CAPACITOR, BYPASS, 0.01 æF, 100V		EA	1
C24	1C10Z5U104M100B	1C10Z5U104M100B	E0190	.CAPACITOR, BYPASS, 0.01 æF, 100V		EA	1
C25	1C10Z5U104M100B	1C10Z5U104M100B	E0190	.CAPACITOR, BYPASS, 0.01 æF, 100V		EA	1
C26	1C10Z5U104M100B	1C10Z5U104M100B	E0190	.CAPACITOR, BYPASS, 0.01 æF, 100V		EA	1
C27	1C10Z5U104M100B	1C10Z5U104M100B	E0190	.CAPACITOR, BYPASS, 0.01 æF, 100V		EA	1
C28	1C10Z5U104M100B	1C10Z5U104M100B	E0190	.CAPACITOR, BYPASS, 0.01 æF, 100V		EA	1
C29	1C10Z5U104M100B	1C10Z5U104M100B	E0190	.CAPACITOR, BYPASS, 0.01 æF, 100V		EA	1
C30	1C10Z5U104M100B	1C10Z5U104M100B	E0190	.CAPACITOR, BYPASS, 0.01 æF, 100V		EA	1
C31	1C10Z5U104M100B	1C10Z5U104M100B	E0190	.CAPACITOR, BYPASS, 0.01 æF, 100V		EA	1
C32	1C10Z5U104M100B	1C10Z5U104M100B	E0190	.CAPACITOR, BYPASS, 0.01 æF, 100V		EA	1
C33	1C10Z5U104M100B	1C10Z5U104M100B	E0190	.CAPACITOR, BYPASS, 0.01 æF, 100V		EA	1
C34	1C10Z5U104M100B	1C10Z5U104M100B	E0190	.CAPACITOR, BYPASS, 0.01 æF, 100V		EA	1
C35	1C10Z5U104M100B	1C10Z5U104M100B	E0190	.CAPACITOR, BYPASS, 0.01 æF, 100V		EA	1
C36	1C10Z5U104M100B	1C10Z5U104M100B	E0190	.CAPACITOR, BYPASS, 0.01 æF, 100V		EA	1
C37	1C10Z5U104M100B	1C10Z5U104M100B	E0190	.CAPACITOR, BYPASS, 0.01 æF, 100V		EA	1

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Microprocessor Printed Circuit Board Assy (Dcm) (Fig. 4-9)

Section Figure Item	P/N	OEM P/N	OEM Code	Description	MBTA Code	U/M	Qty per Assy
04-009-C38	1C10Z5U104M100B	1C10Z5U104M100B	E0190	.CAPACITOR, BYPASS, 0.01 æF, 100V		EA	1
C39	1C10Z5U104M100B	1C10Z5U104M100B	E0190	.CAPACITOR, BYPASS, 0.01 æF, 100V		EA	1
C40	1C10Z5U104M100B	1C10Z5U104M100B	E0190	.CAPACITOR, BYPASS, 0.01 æF, 100V		EA	1
C41	1C10Z5U104M100B	1C10Z5U104M100B	E0190	.CAPACITOR, BYPASS, 0.01 æF, 100V		EA	1
C42	1C10Z5U104M100B	1C10Z5U104M100B	E0190	.CAPACITOR, BYPASS, 0.01 æF, 100V		EA	1
C43	1C10Z5U104M100B	1C10Z5U104M100B	E0190	.CAPACITOR, BYPASS, 0.01 æF, 100V		EA	1
C44	1C10Z5U104M100B	1C10Z5U104M100B	E0190	.CAPACITOR, BYPASS, 0.01 æF, 100V		EA	1
C45	1C10Z5U104M100B	1C10Z5U104M100B	E0190	.CAPACITOR, BYPASS, 0.01 æF, 100V		EA	1
C46	UVX1C105MPA	UVX1C105MPA	B0033	.CAPACITOR, ELECTROLYTIC, 1 æF, 16V		EA	1
C47	1C10Z5U104M100B	1C10Z5U104M100B	E0190	.CAPACITOR, BYPASS, 0.01 æF, 100V		EA	1
J03A	BSW-132-04-5-D	BSW-132-04-5-D	B0031	.CONNECTOR BOTTOM MOUNT TERMINAL STRIP 2-ROW, 25-PIN		EA	1
J03B	BSW-132-04-5-D	BSW-132-04-5-D	B0031	.CONNECTOR BOTTOM MOUNT TERMINAL STRIP 2-ROW, 25-PIN		EA	1
J11	161448303008	161448303008	B0006	.CONNECTOR, 48 PIN		EA	1
JP1	JL-100-25-T	JL-100-25-T	B0031	.JUMPER WIRE, TEFLON INSULATED		EA	1
JP2	JL-100-25-T	JL-100-25-T	B0031	.JUMPER WIRE, TEFLON INSULATED		EA	1
JP3	JL-100-25-T	JL-100-25-T	B0031	.JUMPER WIRE, TEFLON INSULATED		EA	1
JP4	JL-100-25-T	JL-100-25-T	B0031	.JUMPER WIRE, TEFLON INSULATED		EA	1

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Microprocessor Printed Circuit Board Assy (Dcm) (Fig. 4-9)

Section Figure Item	P/N	OEM P/N	OEM Code	Description	MBTA Code	U/M	Qty per Assy
04-009-JP5	JL-100-25-T	JL-100-25-T	B0031	.JUMPER WIRE, TEFLON INSULATED		EA	1
Q01	DCT114ESATP	DCT114ESATP	B0034	.TRANSISTOR, WITH BIAS RESISTOR		EA	1
Q02	DCT114ESATP	DCT114ESATP	B0034	.TRANSISTOR, WITH BIAS RESISTOR		EA	1
Q03	DCT114ESATP	DCT114ESATP	B0034	.TRANSISTOR, WITH BIAS RESISTOR		EA	1
R01		1/2 WATT, 1KOHM ñ5%	Z9009	.RESISTOR, 1/2 WATT, 1KOHM ñ5%, CARBON		EA	1
R02		1/2 WATT, 1KOHM ñ5%	Z9009	.RESISTOR, 1/2 WATT, 1KOHM ñ5%, CARBON		EA	1
R03		1/2 WATT, 100KOHM ñ5%	Z9009	.RESISTOR, 1/2 WATT, 100KOHM ñ5%, CARBON		EA	1
R04		1/2 WATT, 100K OHM ñ5%	Z9009	.RESISTOR, 1/2 WATT, 100K OHM ñ5%, CARBON		EA	1
R05		1/2 WATT, 4.7K OHM ñ5%	Z9009	.RESISTOR, 1/2 WATT, 4.7K OHM ñ5%, CARBON		EA	1
R06		1/2 WATT, 10K OHM ñ5%	Z9009	.RESISTOR, 1/2 WATT, 10K OHM ñ5%, CARBON		EA	1
R07		1/2 WATT, 4.7K OHM ñ5%	Z9009	.RESISTOR, 1/2 WATT, 4.7K OHM ñ5%, CARBON		EA	1
R08		1/2 WATT, 4.7K OHM ñ5%	Z9009	.RESISTOR, 1/2 WATT, 4.7K OHM ñ5%, CARBON		EA	1
R10		1/2 WATT, 100K OHM ñ5%	Z9009	.RESISTOR, 1/2 WATT, 100K OHM ñ5%, CARBON		EA	1
R12		1/2 WATT, 4.7K OHM ñ5%	Z9009	.RESISTOR, 1/2 WATT, 4.7K OHM ñ5%, CARBON		EA	1
R22		3.6K OHM, 1/2 WATT	Z9009	.RESISTOR, 3.6K OHM, 1/2 WATT, CARBON		EA	1
RN1	CS10A-01-100	CS10A-01-100	E0194	.BUSSED RESISTOR, 100 OHM, 1/8 WATT, 10 PIN SIP		EA	1
RN2	CS10A-01-2.2K	CS10A-01-2.2K	E0194	.BUSSED RESISTOR, 2.2K OHM, 1/8 WATT, 10 PIN SIP		EA	1
RN3	CS10A-01-100	CS10A-01-100	E0194	.BUSSED RESISTOR, 100 OHM, 1/8 WATT, 10 PIN SIP		EA	1

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Microprocessor Printed Circuit Board Assy (Dcm) (Fig. 4-9)

Section Figure Item	P/N	OEM P/N	OEM Code	Description	MBTA Code	U/M	Qty per Assy
04-009-RN4	CS10A-01-2.2K	CS10A-01-2.2K	E0194	.BUSSED RESISTOR, 2.2K OHM, 1/8 WATT, 10 PIN SIP		EA	1
RN5	CS10A-01-2.2K	CS10A-01-2.2K	E0194	.BUSSED RESISTOR, 2.2K OHM, 1/8 WATT, 10 PIN SIP		EA	1
RN6	CS10A-01-2.2K	CS10A-01-2.2K	E0194	.BUSSED RESISTOR, 2.2K OHM, 1/8 WATT, 10 PIN SIP		EA	1
RN7	CS10A-01-2.2K	CS10A-01-2.2K	E0194	.BUSSED RESISTOR, 2.2K OHM, 1/8 WATT, 10 PIN SIP		EA	1
RN8	CS10A-01-2.2K	CS10A-01-2.2K	E0194	.BUSSED RESISTOR, 2.2K OHM, 1/8 WATT, 10 PIN SIP		EA	1
RN9	110-93-632-41-0	110-93-632-41-001	B0054	.EPROM SOCKET, 32-PIN (FOR U16)		EA	1
RN9	ACCS68-Z	ACCS68-Z	B0050	.SOCKET, MICROPROCESSOR (FOR U07)		EA	1
RN9	CS10A-01-100	CS10A-01-100	E0194	.BUSSED RESISTOR, 100 OHM, 1/8 WATT, 10 PIN SIP		EA	1
U01	TC323CPE	TC323CPE	B0050	.TRANSCEIVER, RS232		EA	1
U02	MAX485	MAX485	B0050	.TRANSCEIVER, RS485		EA	1
U03	AM26LS32ACN	AM26LS32ACN	E0198	.LOGIC CHIP, DIP PACKAGE		EA	1
U04	SN74HCO2N	SN74HCO2N	B0050	.DIP PACKAGE, LOGIC CHIP NOR GATE		EA	1
U05	SN74HC32N	SN74HC32N	B0050	.DIP PACKAGE, QUAD 2 INPUT POSITIVE		EA	1
U06	SN74HCO4N	SN74HCO4N	B0050	.DIP PACKAGE, HEX INVERTER		EA	1
U07	S80C552-5A68	S80C552-5A68	E0101	.MICROPROCESSOR, 68 PIN PLCC		EA	1
U08	CD74HC573E	CD74HC573E	E0198	.LOGIC CHIP, DIP PACKAGE		EA	1
U09	HCTL-2016	HCTL-2016	E0195	.COUNTER		EA	1
U10	SN74C00N	SN74C00N	E0198	.LOGIC CHIP, DIP PACKAGE NAND GATE		EA	1
U11	MAX692	MAX692	B0050	.CONTROLLER, WATCHDOG TIME AND BATTERY BACKUP		EA	1
U12	74HCT154N	74HCT154N	E0101	.DIP PACKAGE		EA	1
U13	SN74HC32N	SN74HC32N	B0050	.DIP PACKAGE, QUAD 2 INPUT POSITIVE OR GATE		EA	1

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Microprocessor Printed Circuit Board Assy (Dcm) (Fig. 4-9)

Section Figure Item	P/N	OEM P/N	OEM Code	Description	MBTA Code	U/M	Qty per Assy
04-009-U14	HCTL-2016	HCTL-2016	E0195	.COUNTER		EA	1
U15	RTC1287	RTC1287	B0047	.REAL TIME CLOCK		EA	1
U16	TMS27C2512-12	TMS27C2512-12	E0198	.DIP PACKAGE, EPROM		EA	1
U17	TC551001BPL-70	TC551001BPL-70	B0049	.DIP PACKAGE, SRAM		EA	1
U18	XR-88C681CP/28	XR-88C681CP/28	B0048	.DIP PACKAGE, CMOS DUAL CHANNEL UART 28 PIN		EA	1
U19	SN74HC541N	SN74HC541N	E0198	.DIP PACKAGE, OCTAL LINE DRIVER/BUFFER		EA	1
U20	SN74HC541N	SN74HC541N	E0198	.DIP PACKAGE, OCTAL LINE DRIVER/BUFFER		EA	1
U21	CD74HC573E	CD74HC573E	E0198	.LOGIC CHIP, DIP PACKAGE		EA	1
U22	SN74HC541N	SN74HC541N	E0198	.DIP PACKAGE, OCTAL LINE DRIVER/BUFFER		EA	1
U23	CD74HC573E	CD74HC573E	E0198	.LOGIC CHIP, DIP PACKAGE		EA	1
U24	SN74HC541N	SN74HC541N	E0198	.DIP PACKAGE, OCTAL LINE DRIVER/BUFFER		EA	1
U25	SN74HC541N	SN74HC541N	E0198	.DIP PACKAGE, OCTAL LINE DRIVER/BUFFER		EA	1
U26	SN74HC541N	SN74HC541N	E0198	.DIP PACKAGE, OCTAL LINE DRIVER/BUFFER		EA	1
U27	SN74HC14N	SN74HC14N	E0198	.DIP PACKAGE, HEX SCHMITT TRIGGER		EA	1
U28	SN74HC14N	SN74HC14N	E0198	.DIP PACKAGE, HEX SCHMITT TRIGGER		EA	1
U29	SN74HC14N	SN74HC14N	E0198	.DIP PACKAGE, HEX SCHMITT TRIGGER		EA	1
U30	SN74HC14N	SN74HC14N	E0198	.DIP PACKAGE, HEX SCHMITT TRIGGER		EA	1
U31	SN74HC14N	SN74HC14N	E0198	.DIP PACKAGE, HEX SCHMITT TRIGGER		EA	1
U32	SN74HC14N	SN74HC14N	E0198	.DIP PACKAGE, HEX SCHMITT TRIGGER		EA	1
U33	SN74HC14N	SN74HC14N	E0198	.DIP PACKAGE, HEX SCHMITT TRIGGER		EA	1
U34	SN74HC14N	SN74HC14N	E0198	.DIP PACKAGE, HEX SCHMITT TRIGGER		EA	1
Y01	SQ3300-16.588M	SQ3300-16.588M	B0046	.CLOCK OSCILLATOR CRYSTAL, MINI-DIP TRI-STATE		EA	1
Y02	SQ3300-3.6864M	SQ3300-3.6864M	B0046	.CLOCK OSCILLATOR CRYSTAL, MINI-DIP TRI-STATE		EA	1

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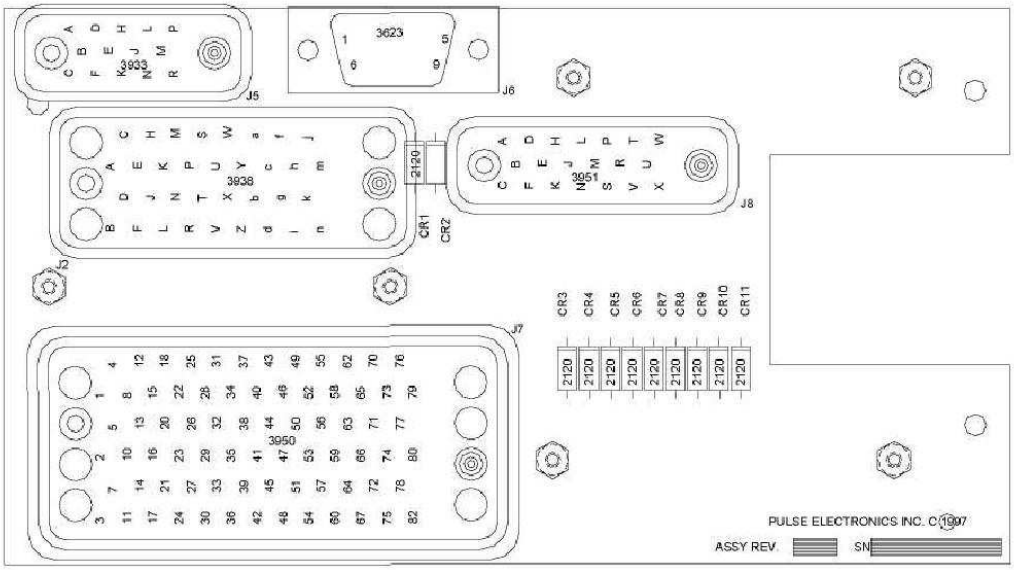
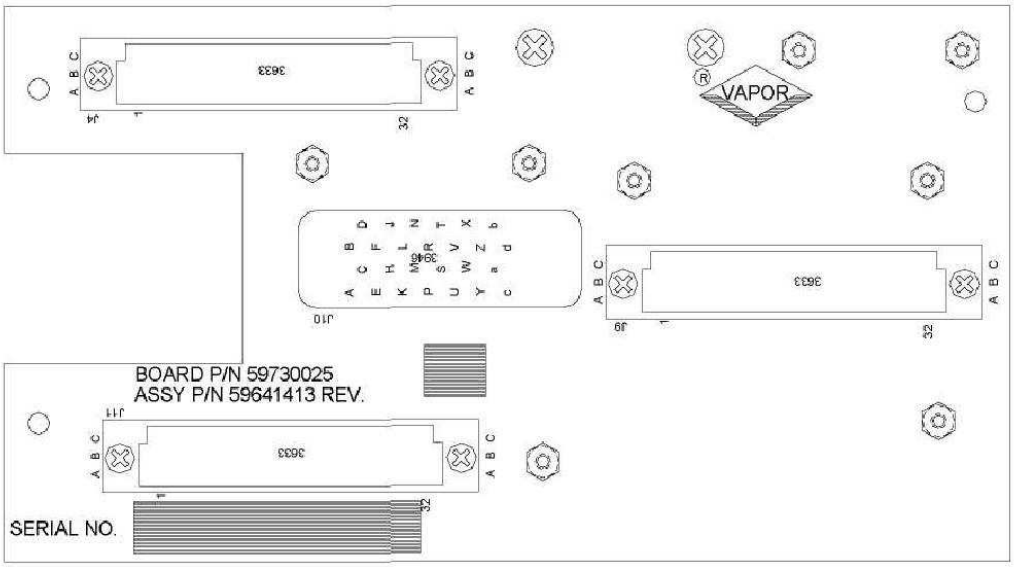


COMPONENT SIDE VIEW



CIRCUIT SIDE VIEW

IPC011

Figure 4-10 Interface Printed Circuit Board Assy (Dcm)

Interface Printed Circuit Board Assy (Dcm) (Fig. 4-10)

Section Figure Item	P/N	OEM P/N	OEM Code	Description	MBTA Code	U/M	Qty per Assy
04-010-	59641413	59641413	E0017	INTERFACE PRINTED CIRCUIT BOARD ASSY (DCM) - SEE Figure 4-6, Figure 4-28 FOR NHA		EA	1
1		NO 4-40 UNCx1/4	Z9009	.SCREW, PAN HD - NO 4 - 40 X - ATT.PT 0.25 - STL, ZNP		EA	2
2		NO 4 - W	Z9009	.WASHER, LOCK, EXT TH - NO 4 - ATT.PT (FOR J06)		EA	2
3		NO 4 - N	Z9009	.NUT, HEX - NO 4 - STL ZNP - ATT.PT (FOR J06)		EA	2
4		COMMERCIAL	Z9009	.SHOULDERED WASHER, - ATT.PT INSULATING (FOR J06)		EA	2
D01	1N4007	1N4007	E0081	.DIODE		EA	1
D02	1N4007	1N4007	E0081	.DIODE		EA	1
D03	1N4007	1N4007	E0081	.DIODE		EA	1
D04	1N4007	1N4007	E0081	.DIODE		EA	1
D05	1N4007	1N4007	E0081	.DIODE		EA	1
D06	1N4007	1N4007	E0081	.DIODE		EA	1
D07	1N4007	1N4007	E0081	.DIODE		EA	1
D08	1N4007	1N4007	E0081	.DIODE		EA	1
D09	1N4007	1N4007	E0081	.DIODE		EA	1
D10	1N4007	1N4007	E0081	.DIODE		EA	1
D11	1N4007	1N4007	E0081	.DIODE		EA	1
J02	GMCT34MOTP000-1	GMCT34MOTP000-14-842.0	B0045	.CONNECTOR, 34-PIN MALE, STRAIGHT		EA	1
J04	MHC-048-012-2	MHC-048-012-2	B0009	.CONNECTOR, 48-PIN, TYPE C, HALF DIN STRAIGHT		EA	1
J05	GMCT14MOTP000-	GMCT14MOTP000-14-842.0	B0045	.CONNECTOR, 14-PIN MALE, STRAIGHT		EA	1
J06	MD9M32S00Z-504	MD9M32S00Z-504.0	E0017	.CONNECTOR, 9 PIN TYPE D		EA	1
J07	GMCT75MOTP000-1	GMCT75MOTP000-14-842.0	B0045	.CONNECTOR, 75 PIN MALE, STRAIGHT		EA	1
J08	GMCT20MOTP000-1	GMCT20MOTP000-14-842.0	B0045	.CONNECTOR, 20-PIN MALE, STRAIGHT		EA	1
J09	MHC-048-012-2	MHC-048-012-2	B0009	.CONNECTOR, 48-PIN, TYPE C, HALF DIN STRAIGHT		EA	1
J10	GMCT26FOTP000-1	GMCT26FOTP000-14-842.0	B0045	.CONNECTOR, 26-PIN FEMALE, STRAIGHT		EA	1
J11	MHC-048-012-2	MHC-048-012-2	B0009	.CONNECTOR, 48-PIN, TYPE C, HALF DIN STRAIGHT		EA	1

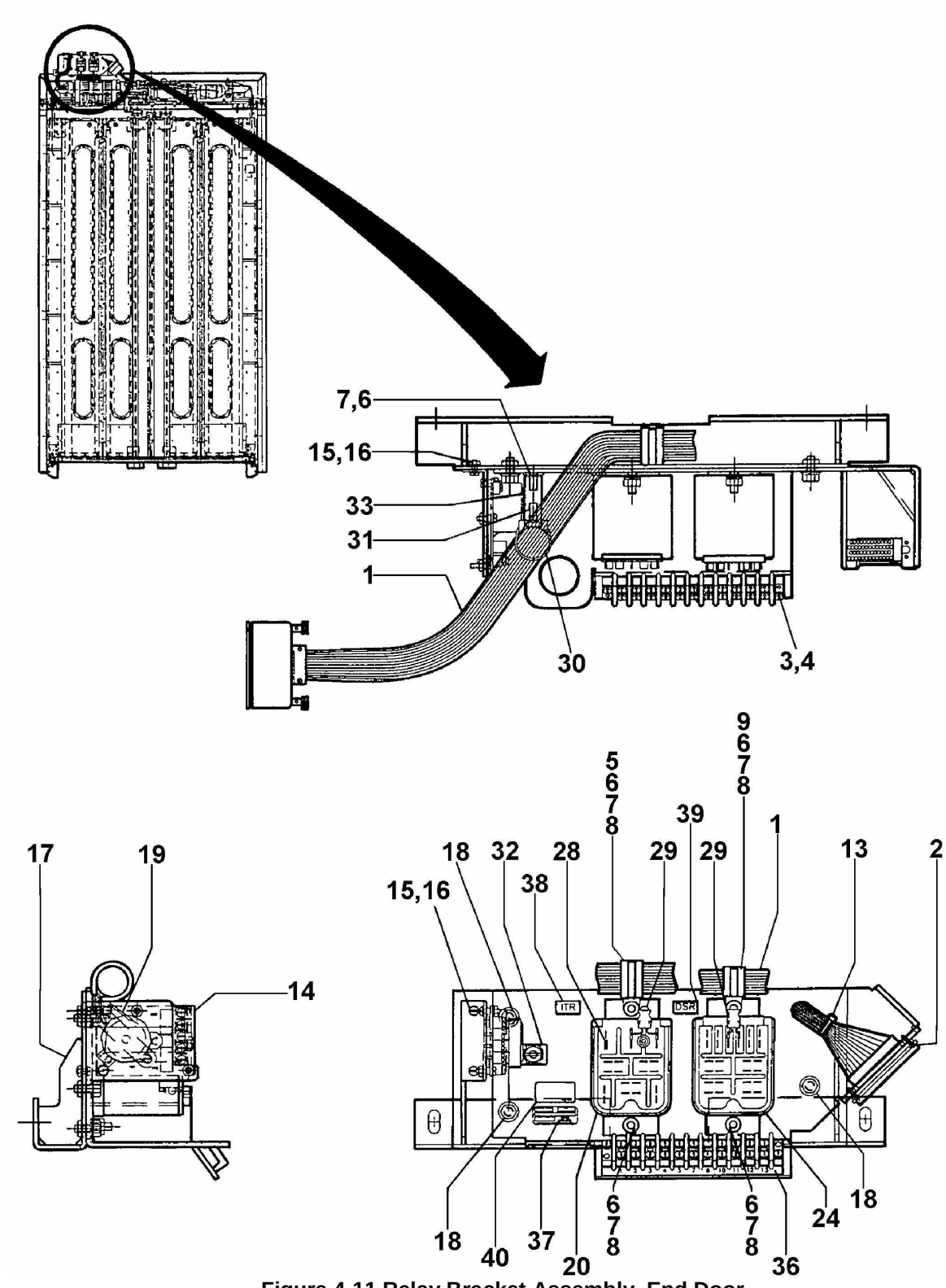


Figure 4-11 Relay Bracket Assembly, End Door

Relay Bracket Assembly, End Door (Fig. 4-11)

Section Figure Item	P/N	OEM P/N	OEM Code	Description	MBTA Code	U/M	Qty per Assy
04-011-	59740772	59740772	E0017	RELAY BRACKET ASSEMBLY, END DOOR SEE Figure 4-4 FOR NHA		EA	1
1	59730135	59730135	E0017	.WIRING HARNESS, END DOOR		EA	1
2	67121015-25	67121015-25	E0017	.SCREW, FIL HEAD - NO 4-40 X - ATT.PT 0.45 - STL ZNP		EA	4
3	67122110-04	67122110-04	E0017	.WASHER, PL - NO 6, 0.312 OD - ATT.PT X 0.028 THK - STL ZNP		EA	4
4	67121004-60	67121004-60	E0017	.SCREW, PHD SLTD SEM - NO - ATT.PT 6-32 X 0.62 - STL ZNP		EA	2
5	47621648-06	47621648-06	E0017	.CLAMP, LOOP (CUSHIONED)		EA	1
6	67122110-07	67122110-07	E0017	.WASHER, PL - 1/4, 0.625 OD X - ATT.PT 0.065 THK - STL ZNP		EA	5
7	67122005-08	67122005-08	E0017	.LOCKWASHER, SPLIT - 1/4, - ATT.PT 0.109 W X 0.062 THK - STL ZNP		EA	5
8	67123000-09	67123000-09	E0017	.NUT, HEX - 1/4-20 UNC - STL - ATT.PT ZNP		EA	4
9	47621648-04	47621648-04	E0017	.CLAMP, LOOP (CUSHIONED)		EA	1
10				DELETED			
11				DELETED			
12				DELETED			
13	56216476-05	56216476-05	E0017	.HARNESS TIE		EA	5
14	59721189-01	59721189-01	E0017	.BRACKET AND PCB ASSEMBLY, END DOOR		EA	1
15	67121000-57	67121000-57	E0017	.SCREW, SLTD PAN HD - NO - ATT.PT 6-32 X 0.375 - STL ZNP		EA	2
16	67122005-04	67122005-04	E0017	.LOCKWASHER, SPLIT - NO 6, - ATT.PT 0.047 W X 0.031 THK - STL ZNP		EA	2
17	59730774	59730774	E0017	.BRACKET ASSEMBLY (WELDED)		EA	1
18	97610773-29	97610773-29	E0017	.SCREW, HEX LK FLG - ¼ - 20 X - ATT.PT 0.50 - STL ZNP		EA	3
19	59730773	59730773	E0017	.MOUNTING PLATE		EA	1
20	37530117-23	37530117-23	E0017	.RELAY, CRITICAL CIRCUIT (3 POLE)		EA	1
21				DELETED			
22				DELETED			
23				DELETED			
24	37531650	37531650	E0017	.RELAY, CRITICAL CIRCUIT (4 FORM C)		EA	1
25				DELETED			

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Relay Bracket Assembly, End Door (Fig. 4-11)

Section Figure Item	P/N	OEM P/N	OEM Code	Description	MBTA Code	U/M	Qty per Assy
04-011-26				DELETED			
27				DELETED			
28	58710125	58710125	E0017	.FASTON TAB CAP		EA	5
29	98610029-01	98610029-01	E0017	.VARISTOR ASSEMBLY		EA	2
30	56216476-06	56216476-06	E0017	.HARNESS TIE		EA	1
31	67121001-39	67121001-39	E0017	.SCREW, PAN HEAD – 1/4 - 20 X - ATT.PT 0.750 - STL ZNP		EA	1
32	17511482-03	17511482-03	E0017	.TIE MOUNT		EA	1
33	16116091-48	16116091-48	E0017	.MOUNTING POST		EA	1
34				DELETED			
35				DELETED			
36	96520039-45	96520039-45	E0017	.MARKER STRIP		EA	1
37	97521940-79	97521940-79	E0017	.LABEL, IDENTIFICATION		EA	1
38	59110146-21	59110146-21	E0017	.LABEL, IDENTIFICATION (DSR)		EA	1
39	59520205-40	59520205-40	E0017	.LABEL, IDENTIFICATION		EA	1
40	97521926-64	97521926-64	E0017	LABEL, IDENTIFICATION		EA	1

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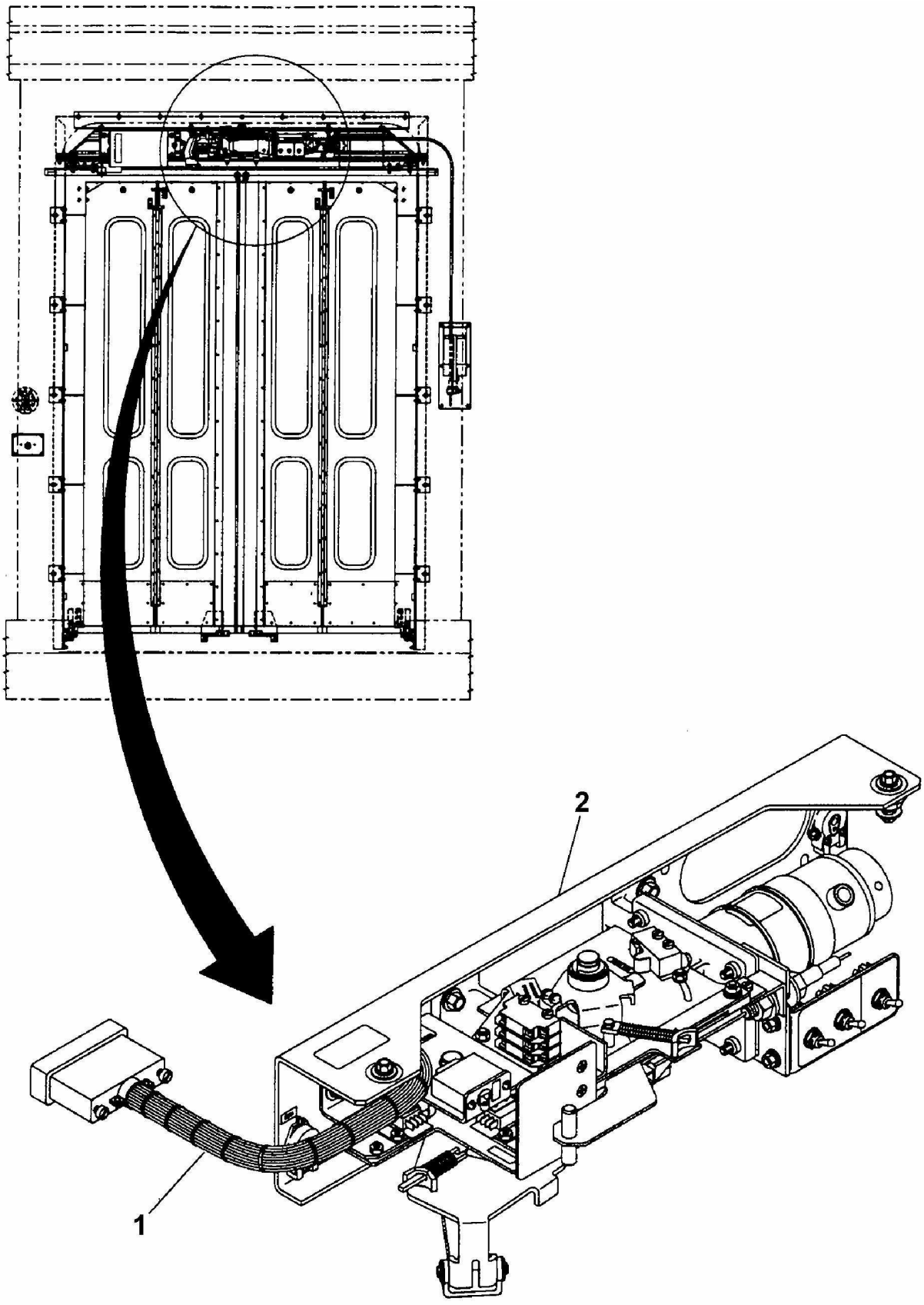

Figure 4-12 Door Operator With Wiring Harness

Door Operator With Wiring Harness (Fig. 4-12)

Section Figure Item	P/N	OEM P/N	OEM Code	Description	MBTA Code	U/M	Qty per Assy
04-012-	NO NUMBER	NO NUMBER		DOOR OPERATOR WITH WIRING HARNESS		EA	1
1	59720136	59720136	E0017	.WIRING HARNESS, CENTER DOOR		EA	1
1A	59720137	59720137	E0017	.WIRING HARNESS, END DOOR		EA	1
2	59660941	59660941	E0017	.DOOR OPERATOR, CENTER DOOR - SEE Figure 4-30 FOR DETAIL		EA	1
2A	59660941-01	59660941-01	E0017	.DOOR OPERATOR, END DOOR - SEE Figure 4-13 FOR DETAIL		EA	1

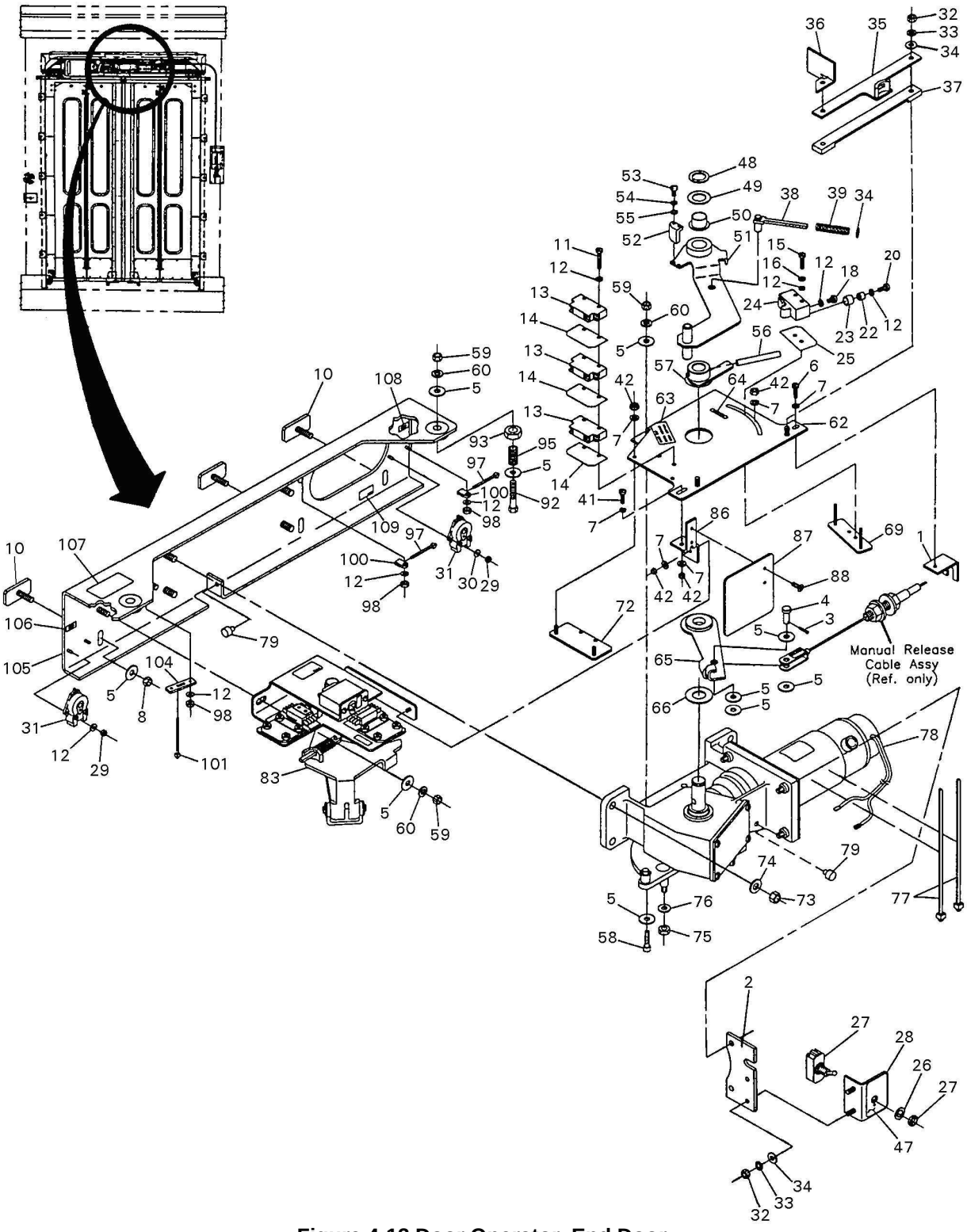

Figure 4-13 Door Operator, End Door

Door Operator, End Door (Fig. 4-13)

Section Figure Item	P/N	OEM P/N	OEM Code	Description	MBTA Code	U/M	Qty per Assy
04-013-	59660941-01	59660941-01	E0017	DOOR OPERATOR, END DOOR - SEE Figure 4-4, Figure 4-12 FOR NHA		EA	1
1	59621366	59621366	E0017	.SUPPORT BRACKET		EA	1
2	59611384	59611384	E0017	.CABLE MOUNTING BRACKET		EA	1
3	67124005-09	67124005-09	E0017	.PIN, COTTER - 0.094 D X 1.00 - ATT.PT LG - STL ZNP		EA	1
4	17511373-03	17511373-03	E0017	.PIN, CLEVIS - 5/16 X 0.66 LG - - ATT.PT STL ZPL		EA	1
5	67122110-08	67122110-08	E0017	.WASHER, PL - 5/16, 0.688 OD X - ATT.PT 0.065 THK - STL ZNP		EA	23
6	67121001-25	67121001-25	E0017	.SCREW, SLTD PAN HD - NO - ATT.PT 10-32 X 0.44 - STL ZNP		EA	1
7	67122110-06	67122110-06	E0017	.WASHER, PL - NO 10, 0.438 OD - ATT.PT X 0.032 THK - STL ZNP		EA	8
8	56710106-17	56710106-17	E0017	.NUT, SELF-LOCKING - 5/16-18 - - ATT.PT STL ZNP		EA	5
9				DELETED			
10	59620945	59620945	E0017	.MOUNTING BAR		EA	5
11	67121004-71	67121004-71	E0017	.SCREW, PHD SLTD SEM - NO - ATT.PT 6-32 X 1.25 - STL ZNP		EA	2
12	67122110-04	67122110-04	E0017	.WASHER, PL - NO 6, 0.312 OD X 0.028 THK - STL ZNP		EA	16
13	58920276-04	58920276-04	E0017	.SWITCH		EA	3
14	58110850-02	58110850-02	E0017	.INSULATOR, SWITCH		EA	3
15	67111201-02	67111201-02	E0017	.SCREW, SPECIAL, PHD - 32 X - ATT.PT 1.12 - STL ZNP		EA	2
16	67122001-01	67122001-01	E0017	.LOCKWASHER, EXT - NO 6, - ATT.PT 0.317 OD X 0.020 THK - STL ZNP		EA	2
17				DELETED			
18	67121004-56	67121004-56	E0017	.SCREW, PHD SLTD SEM - NO - ATT.PT 6-32 X 0.31 - STL ZNP		EA	3
19				DELETED			
20	67121004-61	67121004-61	E0017	.SCREW, PHD SLTD SEM - NO - ATT.PT 6-32 X 0.75 - STL ZNP		EA	1
21				DELETED			
22	57411176-03	57411176-03	E0017	.SPACER		EA	1
23	96326010-31	96326010-31	E0017	.TUBING, INSULATING		EA	1
24	57510235	57510235	E0017	.LEVER SWITCH		EA	1
25	58110850	58110850	E0017	.INSULATOR, SWITCH		EA	1
26	19210928	19210928	E0017	.LOCKING RING - ATT.PT		EA	3

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Door Operator, End Door (Fig. 4-13)

Section Figure Item	P/N	OEM P/N	OEM Code	Description	MBTA Code	U/M	Qty per Assy
04-013-27	47610098	47610098	E0017	.TOGGLE SWITCH		EA	1
28	59621368-01	59621368-01	E0017	.SWITCH MOUNTING BRACKET END DOORS		EA	1
29	67113015-01	67113015-01	E0017	.NUT, HEX KEPS - ATT.PT		EA	4
30				DELETED			
31	57410099-02	57410099-02	E0017	.SWITCH, SENSITIVE EDGE		EA	2
32	67123000-09	67123000-09	E0017	.NUT, HEX - 1/4-20 UNC - STL - ATT.PT ZNP		EA	6
33	67122005-08	67122005-08	E0017	.LOCKWASHER, SPLIT - 1/4, - ATT.PT 0.109 W X 0.062 THK - STL ZNP		EA	6
34	67122110-07	67122110-07	E0017	.WASHER, PL - 1/4, 0.625 OD X - ATT.PT 0.065 THK - STL ZNP		EA	5
35	59630961	59630961	E0017	.TOGGLE BRACKET ASSEMBLY		EA	2
36	59820212	59820212	E0017	.PLATE ASSEMBLY		EA	1
37	59621364	59621364	E0017	.SLIDE BAR		EA	1
38	56216311-06	56216311-06	E0017	.TOGGLE		EA	1
39	58110870	58110870	E0017	.SPRING, COMPRESSION HELICAL		EA	1
40				DELETED			
41	67121001-27	67121001-27	E0017	.SCREW, PAN HEAD - NO 10-32 - ATT.PT X 0.625 - STL ZNP		EA	1
42	67113015-03	67113015-03	E0017	.NUT, HEX KEPS - NO 10-32 - - ATT.PT		EA	6
				STL ZNP			
43				DELETED			
44				DELETED			
45				DELETED			
46				DELETED			
47	59621368	59621368	E0017	.LABEL, INDICATING		EA	1
48	96520020-48	96520020-48	E0017	.RETAINING RING, EXTERNAL - ATT.PT		EA	1
49	56910436-01	56910436-01	E0017	.WASHER, THRUST		EA	2
50	57110105-27	57110105-27	E0017	.FLANGED BEARING		EA	1
51	59630963	59630963	E0017	.EMERGENCY HANDLE		EA	1
52	59810213	59810213	E0017	.CAM		EA	1
53	67121000-29	67121000-29	E0017	.SCREW, PHD SLTD - NO 4-40 X - ATT.PT 0.75 - STL ZNP		EA	2
54	67122005-02	67122005-02	E0017	.LOCKWASHER, SPLIT - NO 4, - ATT.PT 0.040 W X 0.025 THK - STL ZNP		EA	2

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Door Operator, End Door (Fig. 4-13)

Section Figure Item	P/N	OEM P/N	OEM Code	Description	MBTA Code	U/M	Qty per Assy
04-013-55	67122110-02	67122110-02	E0017	.WASHER, PL - NO 4, 0.281 OD - ATT.PT X 0.025 THK - STL ZNP		EA	2
56	67124000-54	67124000-54	E0017	.PIN, 'SPIROL', HEAVY - 0.312 X - ATT.PT 2.50 LG		EA	1
57	59720083	59720083	E0017	.SWITCH CAM		EA	1
58	67111016-21	67111016-21	E0017	.SCREW, HEX SCH CAP - - ATT.PT 5/16-18 X 0.88 - STL ZNP		EA	2
59	67123000-11	67123000-11	E0017	.NUT, HEX - 5/16-18 UNC - STL - ATT.PT ZNP		EA	6
60	67122005-09	67122005-09	E0017	.LOCKWASHER, SPLIT - 5/16, - ATT.PT 0.125 W X 0.078 THK - STL ZNP		EA	6
61				DELETED			
62	59746655	59746655	E0017	.SWITCH AND LEVER BRACKET		EA	1
63	97521942-01	97521942-01	E0017	.LABEL, IDENTIFICATION		EA	1
64	97521930-01	97521930-01	E0017	.LABEL, IDENTIFICATION		EA	1
65	59630969	59630969	E0017	.LEVER ASSEMBLY		EA	1
66	59610436-01	59610436-01	E0017	.WASHER, THRUST		EA	1
67				DELETED			
68				DELETED			
69	59720084	59720084	E0017	.PLATE ASSEMBLY SWITCH		EA	1
70				DELETED			
71				DELETED			
72	59720212	59720212	E0017	.PLATE ASSEMBLY, SWITCH		EA	1
73	56710106-11	3/8-16 UNC ANSI B18.2.2aN	Z9009	.NUT, HEX - 3/8-16 UNC ANSI - ATT.PT B18.2.2 - STL ZNP		EA	4
74	67122110-09	67122110-09	E001	7 .WASHER, PL - 3/8, 0.813 OD X - ATT.PT 0.065 THK - STL ZNP		EA	4
75	56710106-13	56710106-13	E0017	.NUT, LOCKING - 5/16-24 - ATT.PT		EA	2
76	67122110-41	67122110-41	E0017	.WASHER, PL - 5/16, 0.065 OD X - ATT.PT 0.065 THK - STL ZNP		EA	2
77	56216476-02	56216476-02	E0017	.HARNESS TIE		EA	2
78	59640952	59640952	E0017	.MOTOR AND GEAR HOUSING ASSEMBLY – SEE Figure 4-15 FOR DETAIL		EA	4
78	59640952	59640952	E0017	.MOTOR AND GEAR HOUSING ASSEMBLY - SEE Figure 4-15 FOR DETAIL		EA	4
79	56316236	56316236	E0017	.BUMPER		EA	2
80				DELETED			
81				DELETED			

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Door Operator, End Door (Fig. 4-13)

Section Figure Item	P/N	OEM P/N	OEM Code	Description	MBTA Code	U/M	Qty per Assy
04-013-82				DELETED			
83	59640946	59640946	E0017	.DOOR OUT-OF-SERVICE ASSEMBLY - SEE Figure 4-14 FOR DETAIL		EA	1
84				DELETED			
85				DELETED			
86	59621365	59621365	E0017	.SUPPORT BRACKET		EA	1
87	59716652	59716652	E0017	.PLATE, BACKING		EA	1
88	67121044-01	67121044-01	E0017	.SCREW, FLAT REC HD - NO 8-32 X 0.31 - SSTL		EA	2
89				DELETED			
90				DELETED			
91				DELETED			
92	67111017-39	67111017-39	E0017	.SCREW, HEX SCH CAP - - ATT.PT 5/16-18 X 1.75 - STL ZNP		EA	2
93	67123005-32	67123005-32	E0017	.NUT, HEX, JAM - 3/4-16 - STL - ATT.PT ZNP		EA	2
94				DELETED			
95	59610944	59610944	E0017	.INSERT ROD		EA	2
96				DELETED			
97	56216476-03	56216476-03	E0017	.HARNESS TIE		EA	2
98	67113015-05	67113015-05	E0017	.NUT, HEX KEPS - NO 6-32 - STL - ATT.PT ZNP		EA	4
99				DELETED			
100	570100229	570100229	E0017	.HARNESS CLIP		EA	2
101	56216476-04	56216476-04	E0017	.HARNESS TIE		EA	2
102				DELETED			
103				DELETED			
104	57511770	57511770	E0017	.PLATE, HARNESS TIE		EA	1
105	59646250	59646250	E0017	.BASE PLATE ASSEMBLY		EA	1
106	57816458-11	57816458-11	E0017	.LABEL, IDENTIFICATION		EA	1
107	97521941-54	97521941-54	E0017	.LABEL, IDENTIFICATION		EA	1
108	57816458-12	57816458-12	E0017	.LABEL, IDENTIFICATION		EA	1
109	97521926-58	97521926-58	E0017	.LABEL, IDENTIFICATION (DO, END)		EA	1

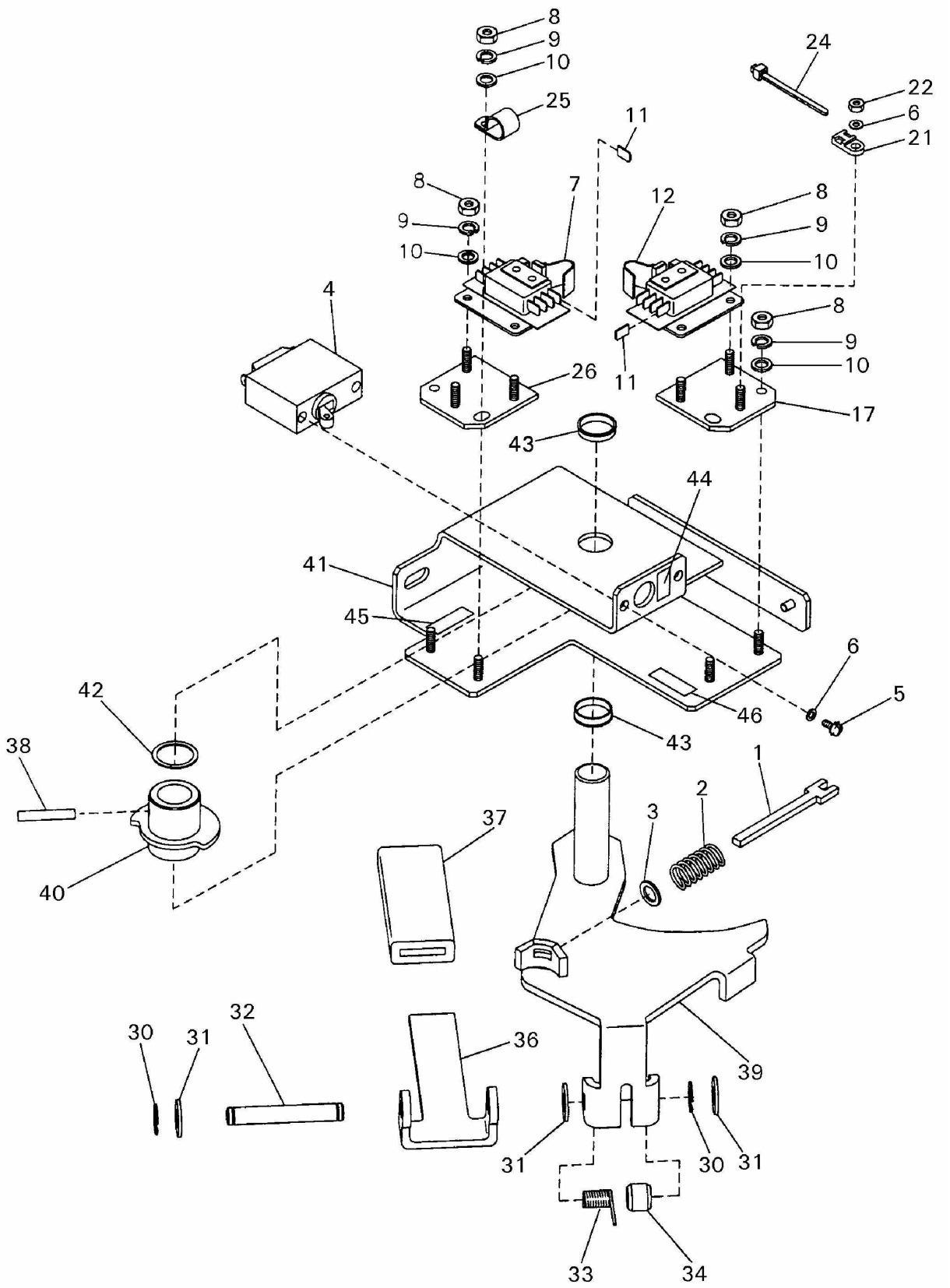

Figure 4-14 Door Out-Of-Service Assembly

Door Out-Of-Service Assembly (Fig. 4-14)

Section Figure Item	P/N	OEM P/N	OEM Code	Description	MBTA Code	U/M	Qty per Assy
04-014-	59640946	59640946	E0017	DOOR OUT-OF-SERVICE ASSEMBLY - SEE Figure 4-13, Figure 4-30 FOR NHA		EA	1
1	56216311-05	56216311-05	E0017	TOGGLE		EA	1
2	58110870	58110870	E0017	.SPRING, COMPRESSION HELICAL		EA	1
3	67122110-07	67122110-07	E0017	.WASHER, PL - 1/4, 0.625 OD X - ATT.PT 0.065 THK - STL ZNP		EA	1
4	57610519-09	57610519-09	E0017	.CIRCUIT BREAKER, 10A, SCREW TERMINAL		EA	1
5	67121004-56	67121004-56	E0017	.SCREW, PHD SLTD SEM - NO - ATT.PT 6-32 X 0.31 - STL ZNP		EA	2
6	67122110-04	67122110-04	E0017	.WASHER, PL - NO 6, 0.312 OD - ATT.PT X 0.028 THK - STL ZNP		EA	3
7	57616490	57616490	E0017	.BRACKET AND SWITCH ASSEMBLY, LH		EA	1
8	67123000-08	67123000-08	E0017	.NUT, HEX - NO 10-32 - STL ZNP - ATT.PT		EA	8
9	67122005-06	67122005-06	E0017	.LOCKWASHER, SPLIT - NO 10, - ATT.PT 0.062 W X 0.047 THK - STL ZNP		EA	8
10	67122110-06	67122110-06	E0017	.WASHER, PL - NO 10, 0.438 OD - ATT.PT X 0.032 THK - STL ZNP		EA	8
11	58710125	58710125	E0017	.FASTON TAB CAP		EA	4
12	57616532	57616532	E0017	.BRACKET AND SWITCH ASSEMBLY, RH		EA	2
13				DELETED			
14				DELETED			
15				DELETED			
16				DELETED			
17	59720995	59720995	E0017	.SWITCH MOUNTING PLATE		EA	1
18				DELETED			
19				DELETED			
20				DELETED			
21	57010229	57010229	E0017	.HARNESS CLIP		EA	1
22	67113015-05	67113015-05	E0017	.NUT, HEX KEPS - NO 6-32 - STL - ATT.PT ZNP		EA	1
23				DELETED			
24	56216476-04	56216476-04	E0017	.HARNESS TIE		EA	1
25	47621648-02	47621648-02	E0017	.CLAMP, LOOP (CUSHIONED)		EA	1
26	59720995-01	59720995-01	E0017	.SWITCH MOUNTING PLATE		EA	1
27				DELETED			
28				DELETED			
29				DELETED			
30	96520020-17	96520020-17	E0017	.RETAINING RING, EXTERNAL - ATT.PT		EA	2

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Door Out-Of-Service Assembly (Fig. 4-14)

Section Figure Item	P/N	OEM P/N	OEM Code	Description	MBTA Code	U/M	Qty per Assy
04-014-31	67122110-09	67122110-09	E0017	.WASHER, PL - 3/8, 0.813 OD X - ATT.PT 0.065 THK - STL ZNP		EA	3
32	59611520	59611520	E0017	.PIN		EA	1
33	59710690	59710690	E0017	.SPRING, TORSION		EA	1
34	59710001	59710001	E0017	.SPACER		EA	1
35				DELETED			
36	59736657	59736657	E0017	.HANDLE		EA	1
37	59621521	59621521	E0017	.GRIP		EA	1
38	67124001-34	67124001-34	E0017	.PIN, ROLL - 0.219 X 1.25 LG - ATT.PT		EA	1
39	59636254	59636254	E0017	.LEVER ASSEMBLY		EA	1
40	59626252	59626252	E0017	.CAM AND HUB ASSEMBLY		EA	1
41	59636251	59636251	E0017	.MOUNTING BRACKET ASSEMBLY		EA	1
42	96510031-13	96510031-13	E0017	.SPACER, END PLAY			AR
43	57312328-10	57312328-10	E0017	.BEARING, NYLON, DOUBLE FLANGED, 3/4 (NOMINAL)		EA	2
44	59520205-27	59520205-27	E0017	.LABEL, IDENTIFICATION		EA	1
45	57826304-34	57826304-34	E0017	.LABEL, IDENTIFICATION		EA	1
46	57826304-33	57826304-33	E0017	.LABEL, IDENTIFICATION		EA	1

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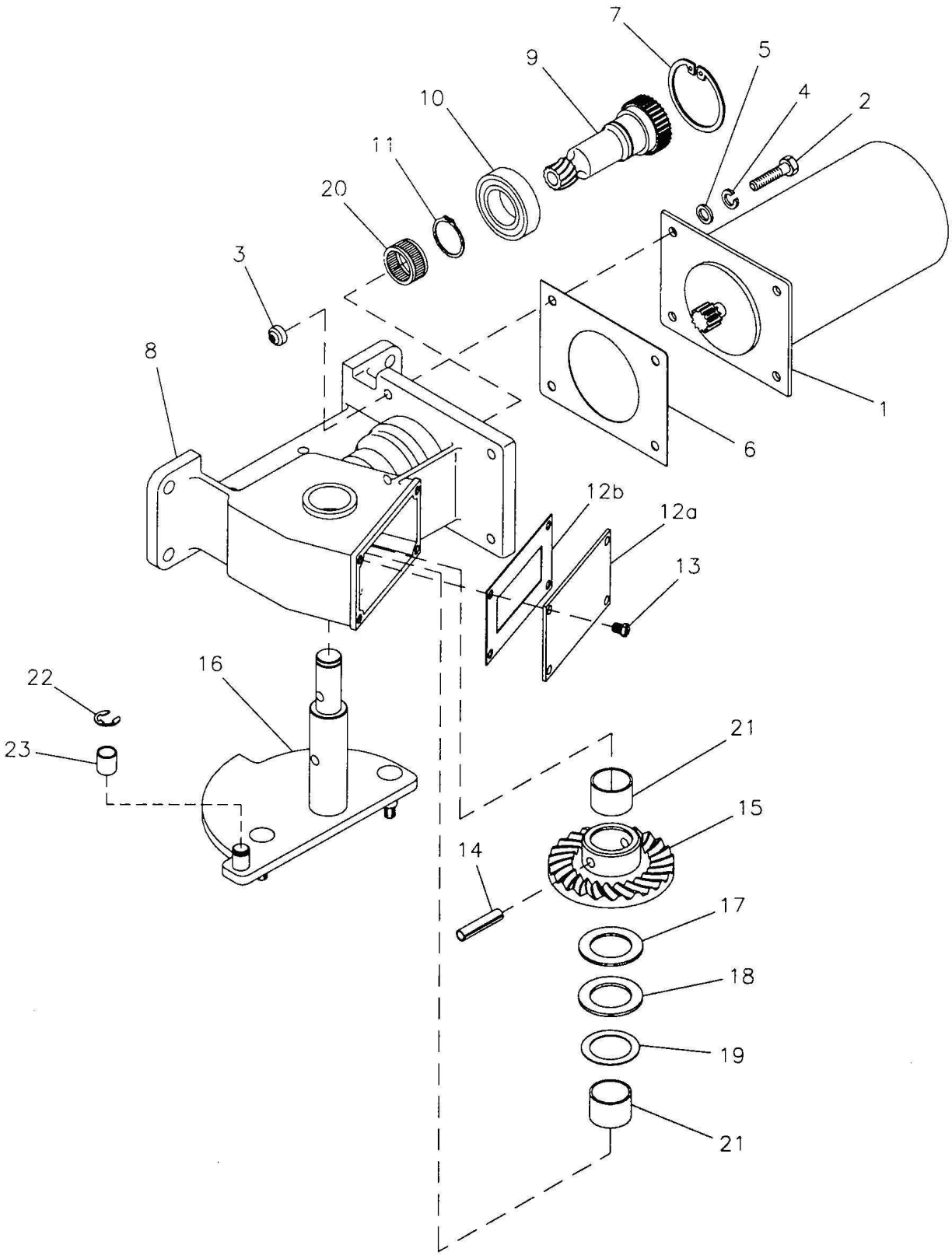

Figure 4-15 Motor And Gear Housing Assembly

Motor And Gear Housing Assembly (Fig. 4-15)

Section Figure Item	P/N	OEM P/N	OEM Code	Description	MBTA Code	U/M	Qty per Assy
04-015-	59640952	59640952	E0017	MOTOR AND GEAR HOUSING ASSEMBLY - SEE Figure 4-13, Figure 4-30 FOR NHA		EA	1
1	59631487	59631487	E0017	.DC MOTOR ASSEMBLY - SEE Figure 4-16 FOR DETAIL		EA	1
2	67111017-06	67111017-06	E0017	.SCREW, HEX SCH CAP - - ATT.PT 5/16-18 X 1.25-STL ZNP		EA	4
3	67123014	67123014	E0017	.PLUG NUT - 5/1 6-18 - STL ZNP - ATT.PT (LN0912)		EA	4
4	67122005-09	67122005-09	E0017	.LOCKWASHER, SPLIT - 5/16, - ATT.PT 0.125 W X 0.078 THK - STL ZNP		EA	4
5	67122110-08	67122110-08	E0017	.WASHER, PL - 5/16, 0.688 OD X - ATT.PT 0.065 THK - STL ZNP		EA	4
6	56810109	56810109	E0017	.GASKET		EA	1
7	96520020-53	96520020-53	E0017	.RETAINING RING, INTERNAL		EA	1
8	56750965-10	56750965-10	E0017	.GEAR HOUSING		EA	1
9	58730227	58730227	E0017	.SPIROID PINION		EA	1
10	56010126	56010126	E0017	.BEARING, BALL		EA	1
11	57711177	57711177	E0017	.RETAINING RING, SPLIT - ATT.PT		EA	1
12	58320545	58320545	E0017	.COVER AND GASKET ASSEMBLY - (N.I.)		EA	1
12A	56711099-22	56711099-22	E0017	.COVER, GEAR HOUSING		EA	1
12B	58310544	58310544	E0017	.GASKET		EA	1
13	67121003-07	67121003-07	E0017	.SCREW, HEX SLTD SEM - NO - ATT.PT 10-32 X 0.50-STL ZNP		EA	1
14	67124000-27	67124000-27	E0017	.PIN, 'SPIROL', HEAVY - 0.312 X - ATT.PT 1.75 LG		EA	1
15	56326003-01	56326003-01	E0017	.SPIROID GEAR		EA	1
16	59630953	59630953	E0017	.SHAFT AND TEETER PLATE ASSEMBLY		EA	1
17	56010127	56010127	E0017	THRUST BEARING, NEEDLE		EA	1
18	56010128	56010128	E0017	.WASHER, THRUST		EA	1
19	56010294	56010294	E0017	.SHIM - THK 0.003		EA	7
20	56010125	56010125	E0017	.NEEDLE BEARING		EA	1
21	95020971-76	95020971-76	E0017	.BUSHING, PLAIN, SLEEVE TYPE		EA	2
22	96520020-04	96520020-04	E0017	.RETAINING RING, EXTERNAL		EA	1
23	59611518	59611518	E0017	.SLEEVE BUSHING		EA	1

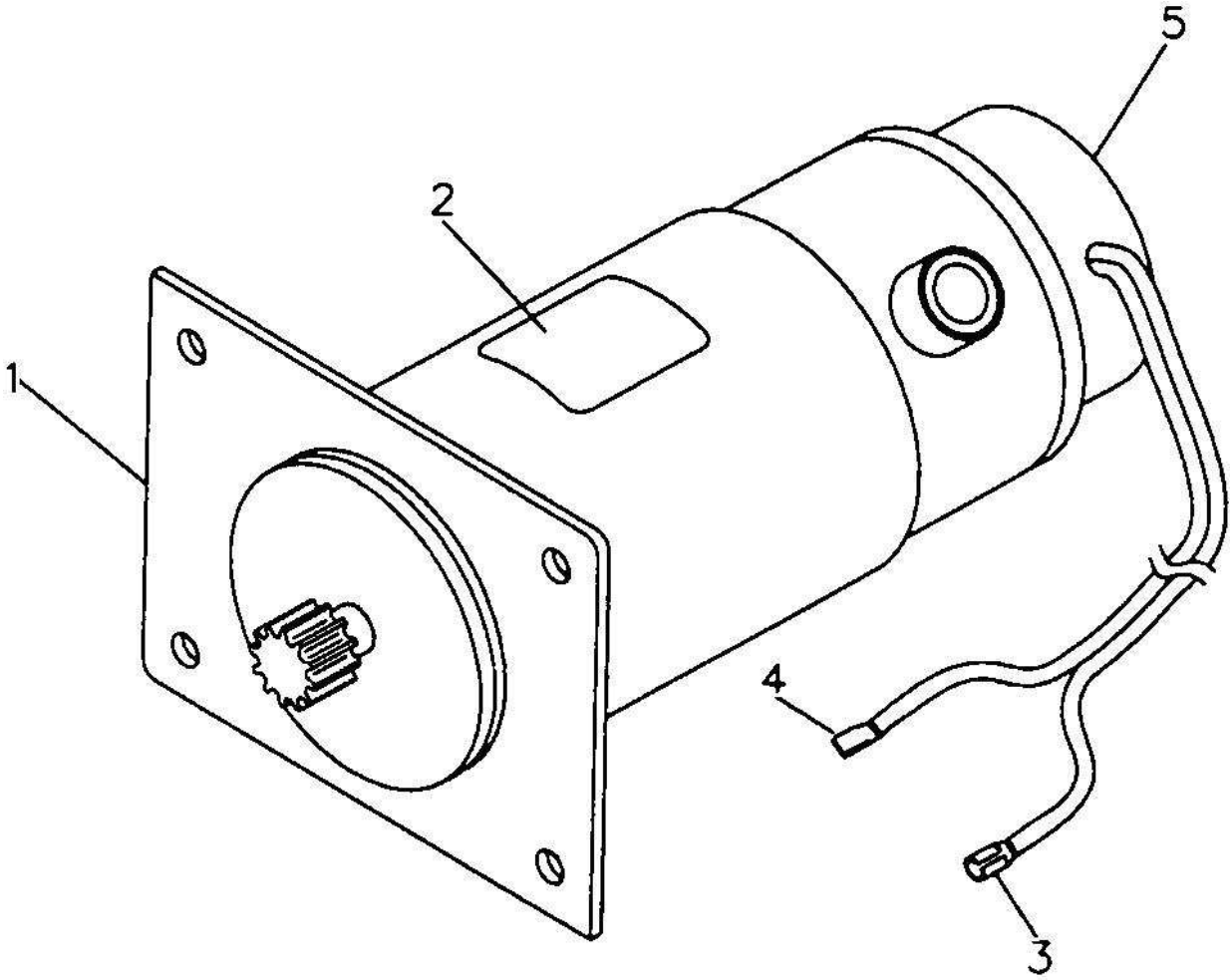

Figure 4-16 DC Motor Assembly

DC Motor Assembly (Fig. 4-16)

Section Figure Item	P/N	OEM P/N	OEM Code	Description	MBTA Code	U/M	Qty per Assy
04-016-	59631487	59631487	E0017	DC MOTOR ASSEMBLY – SEE Figure 4-15 FOR NHA		EA	1
1	59631487-99	59631487-99	E0017	.MOTOR, D.C.		EA	1
2	97521938-96	97521938-96	E0017	.LABEL, IDENTIFICATION		EA	1
3	98010749-05	98010749-05	E0017	.TERMINAL		EA	1
4	98010749-07	98010749-07	E0017	.TERMINAL		EA	1
5	59730046	59730046	E0017	.ENCODER, MOTOR		EA	1

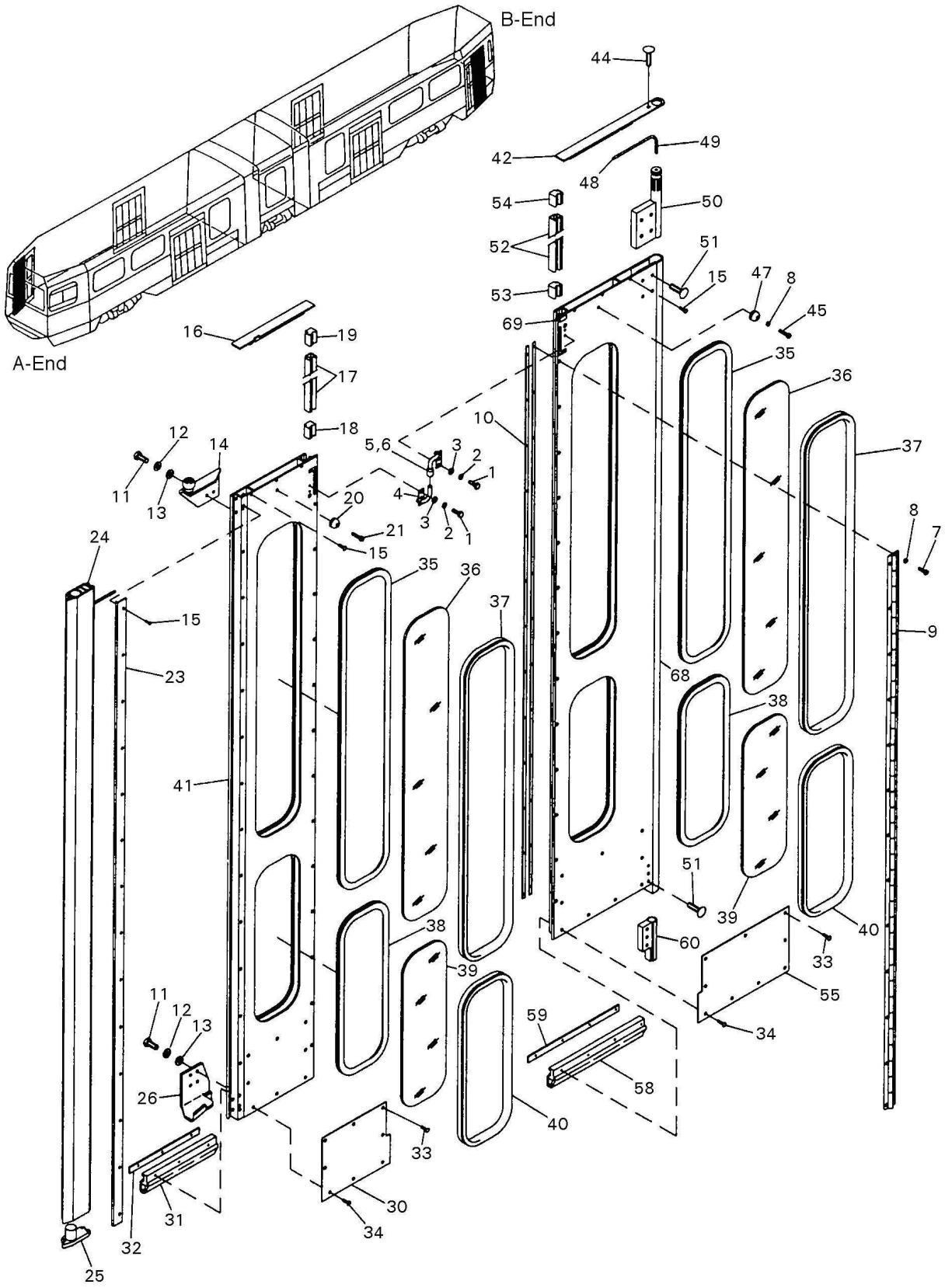

Figure 4-17 Door Panel Assy, High Floor, RH

Door Panel Assy, High Floor, RH (Fig. 4-17)

Section Figure Item	P/N	OEM P/N	OEM Code	Description	MBTA Code	U/M	Qty per Assy
04-017-	59660468	59660468	E0017	DOOR PANEL ASSY, HIGH FLOOR, RH - SEE Figure 4-4 FOR NHA		EA	1
1	67121083-02	67121083-02	E0017	.SCREW, PAN HD REC - NO - ATT.PT 10-32 X 0.75-STL ZNP		EA	4
2	67122005-40	67122005-40	E0017	.LOCKWASHER, SPLIT - NO 10, - ATT.PT 0.062 W x 0.047 THK - STL ZNP		EA	4
3	67122111-06	67122111-06	E0017	.WASHER, PL - NO 10, 0.44 OD - ATT.PT X 0.050 THK - STL ZNP		EA	4
4	58436151-02	58436151-02	E0017	TRANSFER TUBE GUIDE ASSEMBLY		EA	1
5	58436151-03	58436151-03	E0017	.TRANSFER TUBE GUIDE ASSEMBLY		EA	1
6	58510416	58510416	E0017	.ALIGNMENT SLEEVE		EA	1
7	67121083-11	67121083-11	E0017	.SCREW, PAN HD REC - NO - ATT.PT 8-32 X 5/8 - STL ZNP		EA	28
8	67122005-39	67122005-39	E0017	.LOCKWASHER, SPLIT - NO 8, - ATT.PT 0.055 W X 0.040 THK - STL ZNP		EA	29
9	59630901-01	59630901-01	E0017	.HINGE		EA	1
10	59621503-01	59621503-01	E0017	TAPPING STRIP		EA	2
11	67121094-26	67121094-26	E0017	.SCREW, HEX SCH CAP - - ATT.PT 5/16-18 X 1.25-STL ZNP		EA	8
12	67122005-09	67122005-09	E0017	.LOCKWASHER, SPLIT - 5/16, - ATT.PT 0.125 W X 0.078 THK - STL ZNP		EA	8
13	67122110-08	67122110-08	E0017	.WASHER, PL - 5/16, 0.688 OD X - ATT.PT 0.065 THK - STL ZNP		EA	8
14	59630426	59630426	E0017	.ROLLER BRACKET ASSEMBLY, RH - SEE Figure 4-19 FOR DETAIL		EA	1
15	67121043-41	67121043-41	E0017	.SCREW, FLAT REC HD - NO - ATT.PT 6-32 X 0.88 - STL ZNP		EA	20
16	59630904-02	59630904-02	E0017	.PANEL CAP		EA	1
17	59630908	59630908	E0017	.BIPARTING SEAL		EA	1
18	59631510	59631510	E0017	.PLUG, BIPARTING SEAL		EA	1
19	59510929	59510929	E0017	.DOOR FRAME CAP		EA	1
20	59710989	59710989	E0017	.STOP PAD		EA	1
21	67125001-30	67125001-30	E0017	.RIVET, POP, CTSK HD		EA	1
22				DELETED			
23	59620902-01	59620902-01	E0017	.EDGE RETAINER		EA	1
24	58336512-08	58336512-08	E0017	.SENSITIVE EDGE ASSEMBLY		EA	1
25	59631509	59631509	E0017	.PLUG, SENSITIVE EDGE		EA	1
26	59730915	59730915	E0017	.GUIDE BRACKET		EA	1

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Door Panel Assy, High Floor, RH (Fig. 4-17)

Section Figure Item	P/N	OEM P/N	OEM Code	Description	MBTA Code	U/M	Qty per Assy
04-017-27				DELETED			
28				DELETED			
29				DELETED			
30	59620909-02	59620909-02	E0017	.KICK PLATE, LH		EA	1
31	59631508-02	59631508-02	E0017	.BOTTOM SEAL		EA	1
32	59621523-03	59621523-03	E0017	TAPPING PAD		EA	1
33	67121044-05	67121044-05	E0017	.SCREW, FLAT REC HD - NO - ATT.PT 8-32 X 0.62 - STL ZNP		EA	10
34	67121044-07	67121044-07	E0017	.SCREW, FLAT REC HD - NO - ATT.PT 8-32 X 0.88 - STL ZNP		EA	7
35	59630907-02	59630907-02	E0017	.WINDOW SEAL, UPPER OUTSIDE		EA	2
36	59630906-02	59630906-02	E0017	.WINDOW GLASS, UPPER		EA	2
37	59631506-02	59631506-02	E0017	.WINDOW SEAL, UPPER INSIDE		EA	2
38	59630907-03	59630907-03	E0017	.WINDOW SEAL, LOWER OUTSIDE		EA	2
39	59630906-03	59630906-03	E0017	.WINDOW GLASS, LOWER		EA	2
40	59631506-03	59631506-03	E0017	.WINDOW SEAL, LOWER INSIDE		EA	2
41	59640900	59640900	E0017	.DOOR PANEL, RH, W/RIVETS, CENTER		EA	1
42	59630903-01	59630903-01	E0017	.PANEL CAP		EA	1
43				DELETED			
44	67121091-13	67121091-13	E0017	.SCREW, FLAT REC HD - NO - ATT.PT 8-32 X 0.50 - STL ZNP		EA	1
45	67121083-15	67121083-15	E0017	.SCREW, PAN HD REC - NO - ATT.PT 8-32 X 0.75 - STL ZNP		EA	1
46				DELETED			
47	57310510-03	57310510-03	E0017	.RECESSED BUMPER		EA	1
48	57410248	57410248	E0017	.CONNECTING FITTING, NYLON		EA	2
49	57410247-06	57410247-06	E0017	.TUBING			AR
50	59630425	59630425	E0017	.STUB SHAFT AND BRACKET ASSEMBLY		EA	1
51	67111045-09	67111045-09	E0017	.SCREW, FLAT HD - 5/16-18 X - ATT.PT 1.00 - STL ZNP		EA	7

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Door Panel Assy, High Floor, RH (Fig. 4-17)

Section Figure Item	P/N	OEM P/N	OEM Code	Description	MBTA Code	U/M	Qty per Assy
04-017-52	59630908-01	59630908-01	E0017	.BIPARTING SEAL		EA	1
53	59631510-01	59631510-01	E0017	.PLUG, BIPARTING SEAL		EA	1
54	59510929-01	59510929-01	E0017	.DOOR FRAME CAP		EA	1
55	59620910-03	59620910-03	E0017	.KICK PLATE, RH		EA	1
56				DELETED			
57				DELETED			
58	59631507-02	59631507-02	E0017	.BOTTOM SEAL		EA	1
59	59621523-02	59621523-02	E0017	.TAPPING PAD		EA	1
60	59630424	59630424	E0017	.PIVOT BRACKET		EA	1
61				DELETED			
62				DELETED			
63				DELETED			
64				DELETED			
65				DELETED			
66				DELETED			
67				DELETED			
68	59641435	59641435	E0017	.DOOR PANEL, RH, W/RIVETS, HINGED		EA	1
69	97521940-90	97521940-90	E0017	.LABEL, IDENTIFICATION		EA	1

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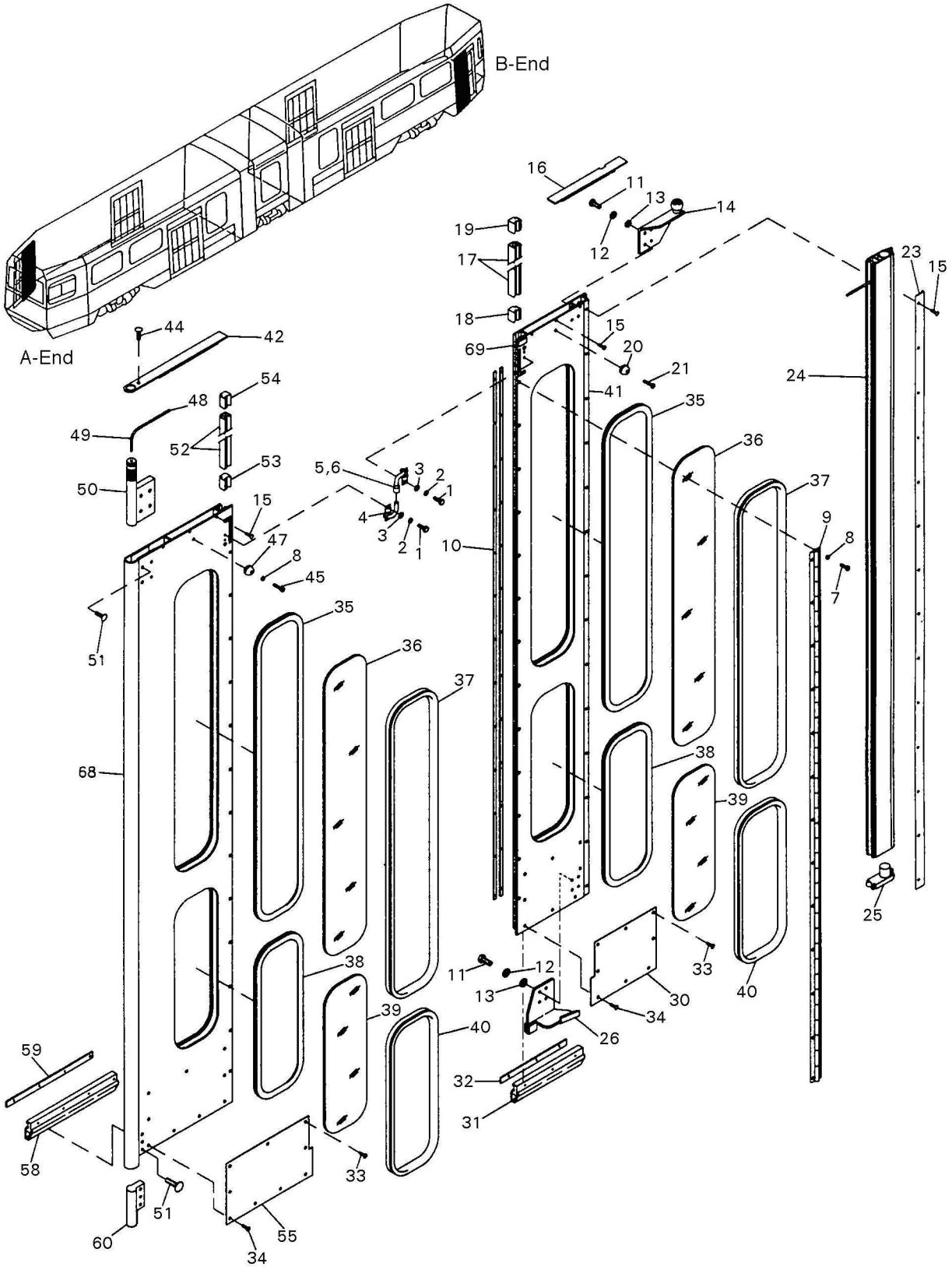

Figure 4-18 Door Panel Assy, High Floor, LH

Door Panel Assy, High Floor, LH (Fig. 4-18)

Section Figure Item	P/N	OEM P/N	OEM Code	Description	MBTA Code	U/M	Qty per Assy
04-018-	59660469	59660469	E0017	DOOR PANEL ASSY, HIGH FLOOR, LH - SEE Figure 4-4 FOR NHA		EA	1
1	67121083-02	67121083-02	E0017	.SCREW, PAN HD REC - NO - ATT.PT 10-32 X 0.75 - STL ZNP		EA	4
2	67122005-40	67122005-40	E0017	.LOCKWASHER, SPLIT - NO 10, - ATT.PT 0.062 W x 0.047 THK - STL ZNP		EA	4
3	67122111-06	67122111-06	E0017	.WASHER, PL - NO 10, 0.44 OD - ATT.PT X 0.050 THK - STL ZNP		EA	4
4	58436151-02	58436151-02	E0017	.TRANSFER TUBE GUIDE ASSEMBLY		EA	1
5	58436151-03	58436151-03	E0017	.TRANSFER TUBE GUIDE ASSEMBLY		EA	1
6	58510416	58510416	E0017	.ALIGNMENT SLEEVE		EA	1
7	67121083-11	67121083-11	E0017	.SCREW, PAN HD REC - NO - ATT.PT 8-32 X 5/8 - STL ZNP		EA	28
8	67122005-39	67122005-39	E0017	.LOCKWASHER, SPLIT - NO 8, - ATT.PT 0.055 W X 0.040 THK - STL ZNP		EA	29
9	59630901-01	59630901-01	E0017	.HINGE		EA	1
10	59621503-01	59621503-01	E0017	.TAPPING STRIP		EA	2
11	67121094-26	67121094-26	E0017	.SCREW, HEX SCH CAP - - ATT.PT 5/16-18X1.25 - STL ZNP		EA	8
12	67122005-09	67122005-09	E0017	.LOCKWASHER, SPLIT - 5/16, - ATT.PT 0.125 W X 0.078 THK - STL ZNP		EA	8
13	67122110-08	67122110-08	E0017	.WASHER, PL - 5/16, 0.688 OD X - ATT.PT 0.065 THK - STL ZNP		EA	8
14	59630462-01	59630462-01	E0017	.ROLLER BRACKET ASSEMBLY, LH - SEE **Figure 4-19** FOR DETAIL		EA	1
15	67121043-41	67121043-41	E0017	.SCREW, FLAT REC HD - NO - ATT.PT 6-32 X 0.88 - STL ZNP		EA	20
16	59630904-03	59630904-03	E0017	.PANEL CAP		EA	1
17	59630908	59630908	E0017	.BIPARTING SEAL		EA	1
18	59631510	59631510	E0017	.PLUG, BIPARTING SEAL		EA	1
19	59510929	59510929	E0017	.DOOR FRAME CAP		EA	1
20	59710989	59710989	E0017	.STOP PAD		EA	1
21	67125001-30	67125001-30	E0017	.RIVET, POP, CTSK HD		EA	1
22				DELETED			
23	59620902-01	59620902-01	E0017	.EDGE RETAINER		EA	1
24	58336512-08	58336512-08	E0017	.SENSITIVE EDGE ASSEMBLY		EA	1
25	59631509-01	59631509-01	E0017	.PLUG, SENSITIVE EDGE		EA	1

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Door Panel Assy, High Floor, LH (Fig. 4-18)

Section Figure Item	P/N	OEM P/N	OEM Code	Description	MBTA Code	U/M	Qty per Assy
04-018 - 26	59730915-01	59730915-01	E0017	.GUIDE BRACKET		EA	1
27				DELETED			
28				DELETED			
29				DELETED			
30	59620909-03	59620909-03	E0017	.KICK PLATE, LH		EA	1
31	59631508-03	59631508-03	E0017	.BOTTOM SEAL		EA	1
32	59621523-03	59621523-03	E0017	.TAPPING PAD		EA	1
33	67121044-05	67121044-05	E0017	.SCREW, FLAT REC HD - NO - ATT.PT 8-32 X 0.62 – STL ZNP		EA	10
34	67121044-07	67121044-07	E0017	.SCREW, FLAT REC HD - NO - ATT.PT 8-32 X 0.88 - STL ZNP		EA	7
35	59630907-02	59630907-02	E0017	.WINDOW SEAL, UPPER OUTSIDE		EA	2
36	59630906-02	59630906-02	E0017	.WINDOW GLASS, UPPER		EA	2
37	59631506-02	59631506-02	E0017	.WINDOW SEAL, UPPER INSIDE		EA	2
38	59630907-03	59630907-03	E0017	.WINDOW SEAL, LOWER OUTSIDE		EA	2
39	59630906-03	59630906-03	E0017	.WINDOW GLASS, LOWER		EA	2
40	59631506-03	59631506-03	E0017	.WINDOW SEAL, LOWER INSIDE		EA	2
41	59640900-01	59640900-01	E0017	.DOOR PANEL, RH, W/RIVETS, CENTER		EA	1
42	59630903-01	59630903-01	E0017	.PANEL CAP		EA	1
43				DELETED			
44	67121091-13	67121091-13	E0017	.SCREW, FLAT REC HD - NO - ATT.PT 8-32 X 0.50 - STL ZNP		EA	1
45	67121083-15	67121083-15	E0017	.SCREW, PAN HD REC - NO - ATT.PT 8-32 X 0.75 - STL ZNP		EA	1
46				DELETED			
47	57310510-03	57310510-03	E0017	.RECESSED BUMPER		EA	1
48	57410248	57410248	E0017	.CONNECTING FITTING, NYLON		EA	2
49	57410247-06	57410247-06	E0017	.TUBING			AR
50	59630425	59630425	E0017	.STUB SHAFT AND BRACKET ASSEMBLY		EA	1

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Door Panel Assy, High Floor, LH (Fig. 4-18)

Section Figure Item	P/N	OEM P/N	OEM Code	Description	MBTA Code	U/M	Qty per Assy
04-018 - 51	67111045-09	67111045-09	E0017	.SCREW, FLAT HD - 5/16-18 X - ATT.PT 1.00 - STL ZNP		EA	7
52	59630908-01	59630908-01	E0017	.BIPARTING SEAL		EA	1
53	59631510-01	59631510-01	E0017	.PLUG, BIPARTING SEAL		EA	1
54	59510929-01	59510929-01	E0017	.DOOR FRAME CAP		EA	1
55	59620910-02	59620910-02	E0017	.KICK PLATE, RH		EA	1
56				DELETED			
57				DELETED			
58	59631507-03	59631507-03	E0017	.BOTTOM SEAL		EA	1
59	59621523-02	59621523-02	E0017	.TAPPING PAD		EA	1
60	59630424	59630424	E0017	.PIVOT BRACKET		EA	1
61				DELETED			
62				DELETED			
63				DELETED			
64				DELETED			
65				DELETED			
66				DELETED			
67				DELETED			
68	59641435-01	59641435-01	E0017	.DOOR PANEL, RH, W/RIVETS, HINGED		EA	1
69	97521940-91	97521940-91	E0017	.LABEL, IDENTIFICATION		EA	1

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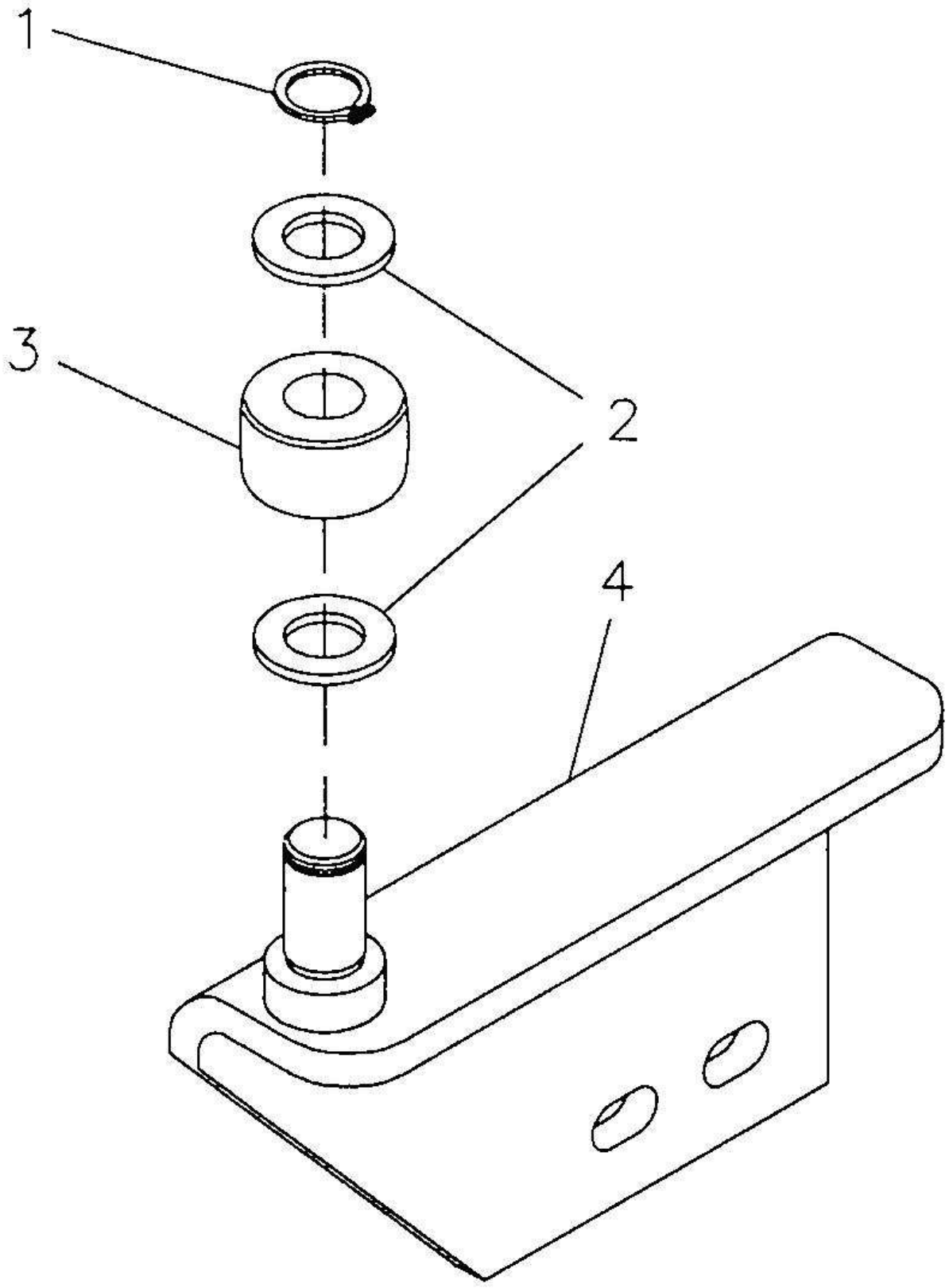


Figure 4-19 Roller Bracket Assembly, RH

Roller Bracket Assembly, RH (Fig. 4-19)

Section Figure Item	P/N	OEM P/N	OEM Code	Description	MBTA Code	U/M	Qty per Assy
04-019-	59630426	59630426	E0017	ROLLER BRACKET ASSEMBLY, RH - SEE Figure 4-17, Figure 4-31 FOR NHA		EA	1
A	59630426-01	59630426-01	E0017	ROLLER BRACKET ASSEMBLY, LH - SEE Figure 4-18, Figure 4-32 FOR NHA		EA	1
1	97920999-23	97920999-23	E0017	.RETAINING RING, EXTERNAL		EA	1
2	57410215-22	57410215-22	E0017	.WASHER, SPECIAL		EA	2
3	59611285	59611285	E0017	.ROLLER ASSEMBLY		EA	1
4	59630916	59630916	E0017	.ROLLER BRACKET ASSY, RH		EA	1
4A	59630916-01	59630916-01	E0017	.ROLLER BRACKET ASSY, LH		EA	1

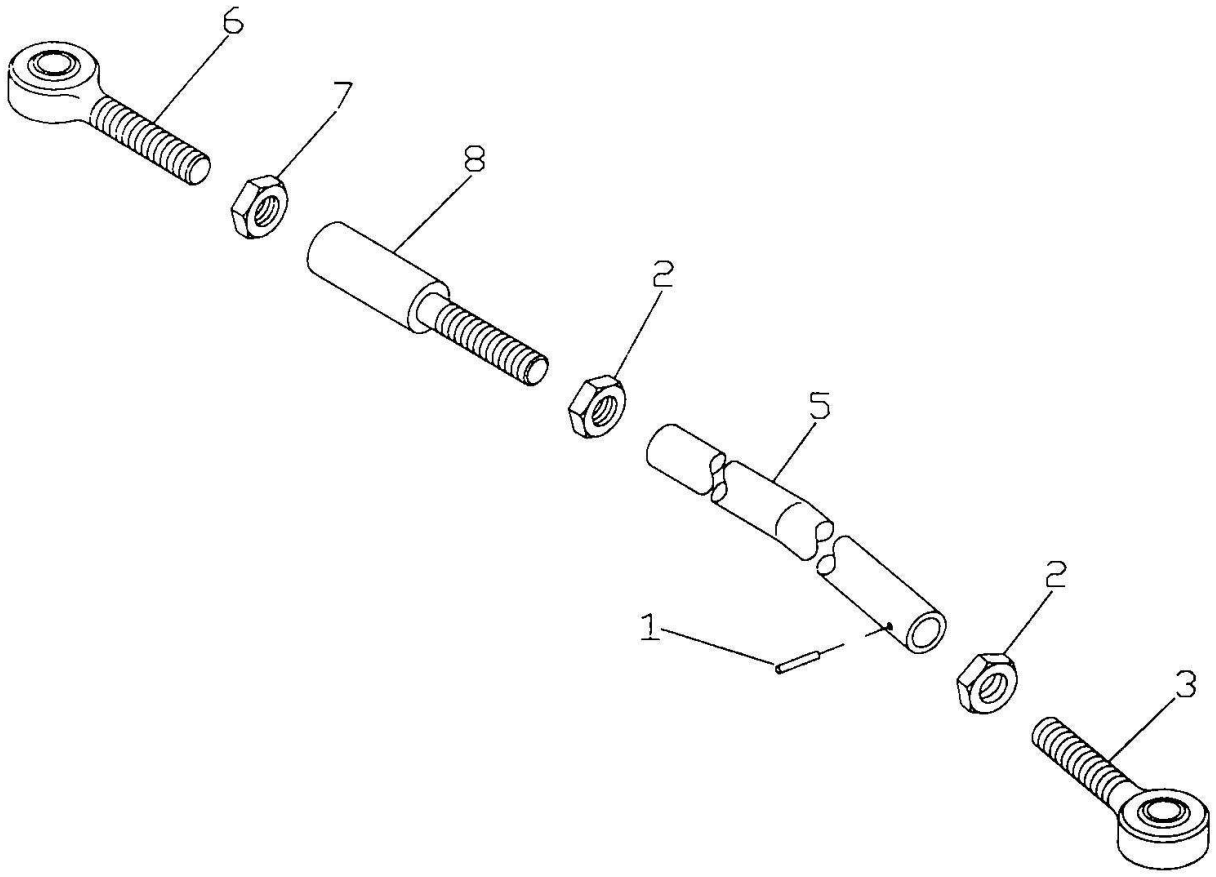


Figure 4-20 Connecting Rod Assy, Angled (Used On LH End Door)

Connecting Rod Assy, Angled (Used On LH End Door) (Fig. 4-20)

Section Figure Item	P/N	OEM P/N	OEM Code	Description	MBTA Code	U/M	Qty per Assy
04-020-	59631526-01	59631526-01	E0017	CONNECTING ROD ASSY, ANGLED (USED ON LH END DOOR) - SEE Figure 4-4 FOR NHA		EA	1
1	67124002-30	67124002-30	E0017	PIN, ROLL - 0.094 X 0.75 LG - ATT.PT		EA	1
2	67123005-06	67123005-06	E0017	NUT, HEX, JAM - 7/16-20 - ATT.PT		EA	2
3	58210305-02	58210305-02	E0017	BEARING, SPHERICAL ROD END		EA	1
4				DELETED			
5	59621525-01	59621525-01	E0017	CONNECTING ROD		EA	1
6	58210305-03	58210305-03	E0017	BEARING, SPHERICAL ROD END		EA	2
7	67113012-08	67113012-08	E0017	NUT, HEX, JAM - 7/16-20 LH - ATT.PT		EA	1
8	58510776-02	58510776-02	E0017	CONNECTING ROD		EA	1

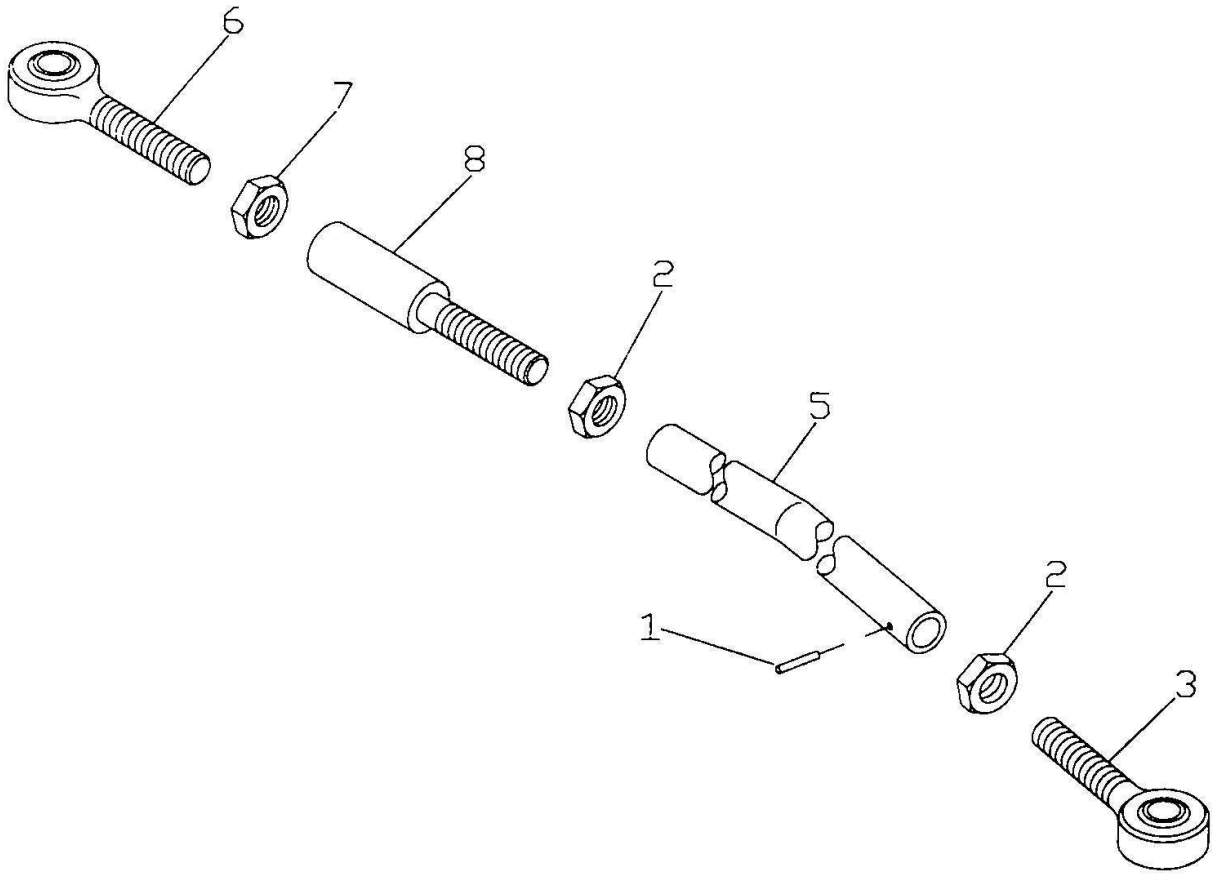


Figure 4-21 Connecting Rod Assembly, Straight (Used On Center Door)

Connecting Rod Assembly, Straight (Used On Center Door) (Fig. 4-21)

Section Figure Item	OEM P/N	P/N	OEM Code	Description	MBTA Code	U/M	Qty per Assy
04-021-	58226130-47	58226130-47	E0017	CONNECTING ROD ASSEMBLY, STRAIGHT (USED ON CENTER DOOR) - SEE Figure 4-26 FOR NHA		EA	1
A	58226130-48	58226130-48	E0017	CONNECTING ROD ASSEMBLY, STRAIGHT (USED ON RH END DOOR) - SEE Figure 4-4 FOR NHA		EA	1
1	58010305-02	58010305-02	E0017	.SPHERICAL BEARING, ROD END		EA	1
2	56010006-04	56010006-04	E0017	.NUT, HEX, JAM, LH - 7/16-20 - ATT.PT		EA	1
3	58110390-75	58110390-75	E0017	.CONNECTING ROD (USED ON CENTER DOOR)		EA	1
3A	58110390-76	58110390-76	E0017	.CONNECTING ROD (USED ON RH END DOOR)		EA	1
4	67123005-24	67123005-24	E0017	.NUT, HEX, JAM - 7/16-20 - ATT.PT		EA	1
5	58210305-03	58210305-03	E0017	.BEARING, SPHERICAL ROD END		EA	2

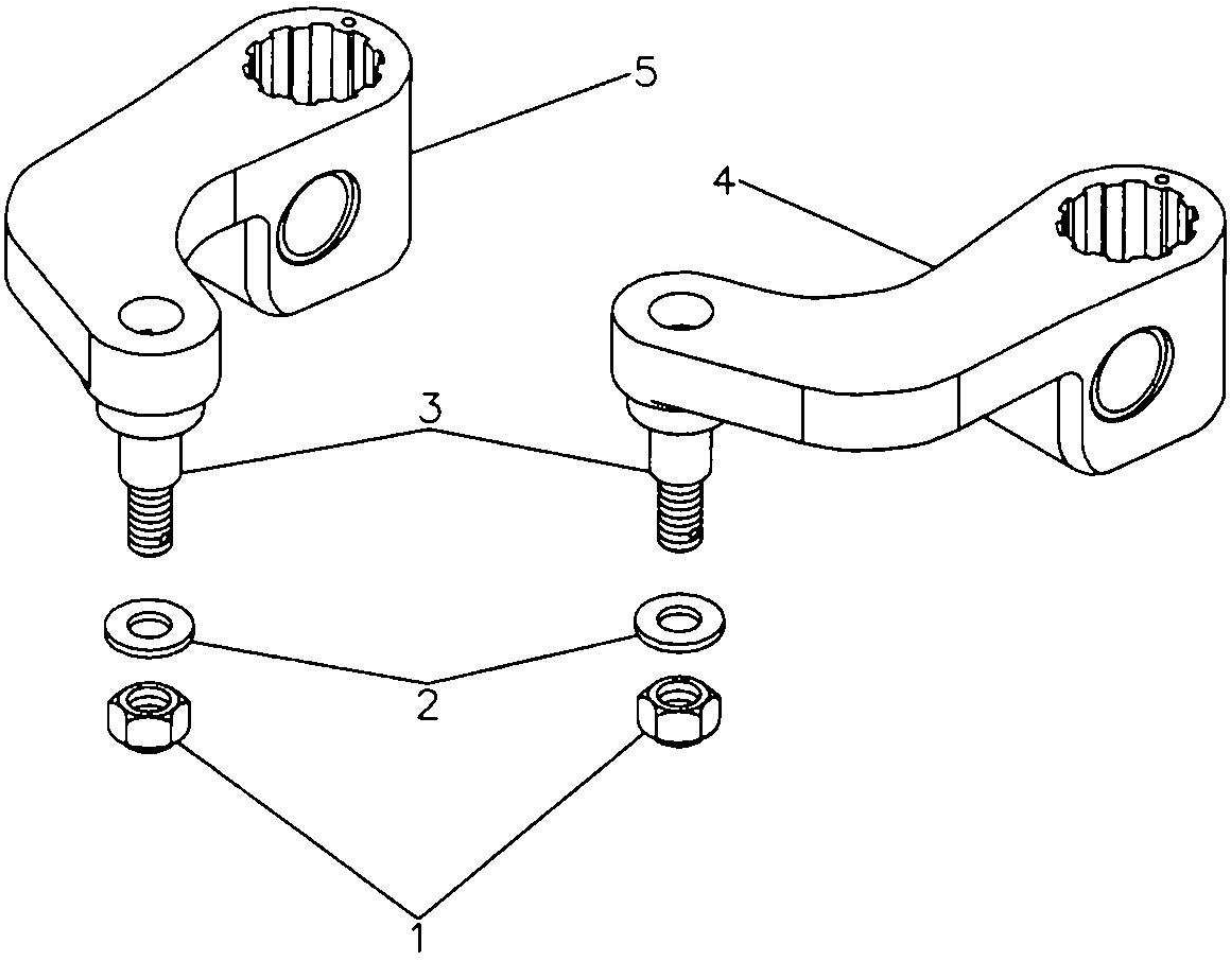


Figure 4-22 Lever Assembly, Door Shaft RH

Lever Assembly, Door Shaft RH (Fig. 4-22)

Section Figure Item	OEM P/N	P/N	OEM Code	Description	MBTA Code	U/M	Qty per Assy
04-022-	59636246	59636246	E0017	LEVER ASSEMBLY, DOOR SHAFT RH - SEE Figure 4-4, Figure 4-26 FOR NHA		EA	1
A	59636246-01	59636246-01	E0017	LEVER ASSEMBLY, DOOR SHAFT LH - SEE Figure 4-4, Figure 4-26 FOR NHA		EA	1
1	56710106-13	56710106-13	E0017	.NUT, LOCKING - 5/16-24 - ATT.PT		EA	1
2	67122110-41	67122110-41	E0017	.WASHER, PL - 5/16, 0.065 OD X - ATT.PT 0.065 THK - STL ZNP		EA	1
3	59610956-02	59610956-02	E0017	.PIN, ROD END (WELDED TO DOOR SHAFT LEVER, ITEM 4 OR 5)		EA	1
4	59636245	59636245	E0017	.DOOR SHAFT LEVER, RH (WELDED TO ROD END PIN, ITEM 3)		EA	1
5	59636245-01	59636245-01	E0017	.DOOR SHAFT LEVER, LH (WELDED TO ROD END PIN, ITEM 3)		EA	1

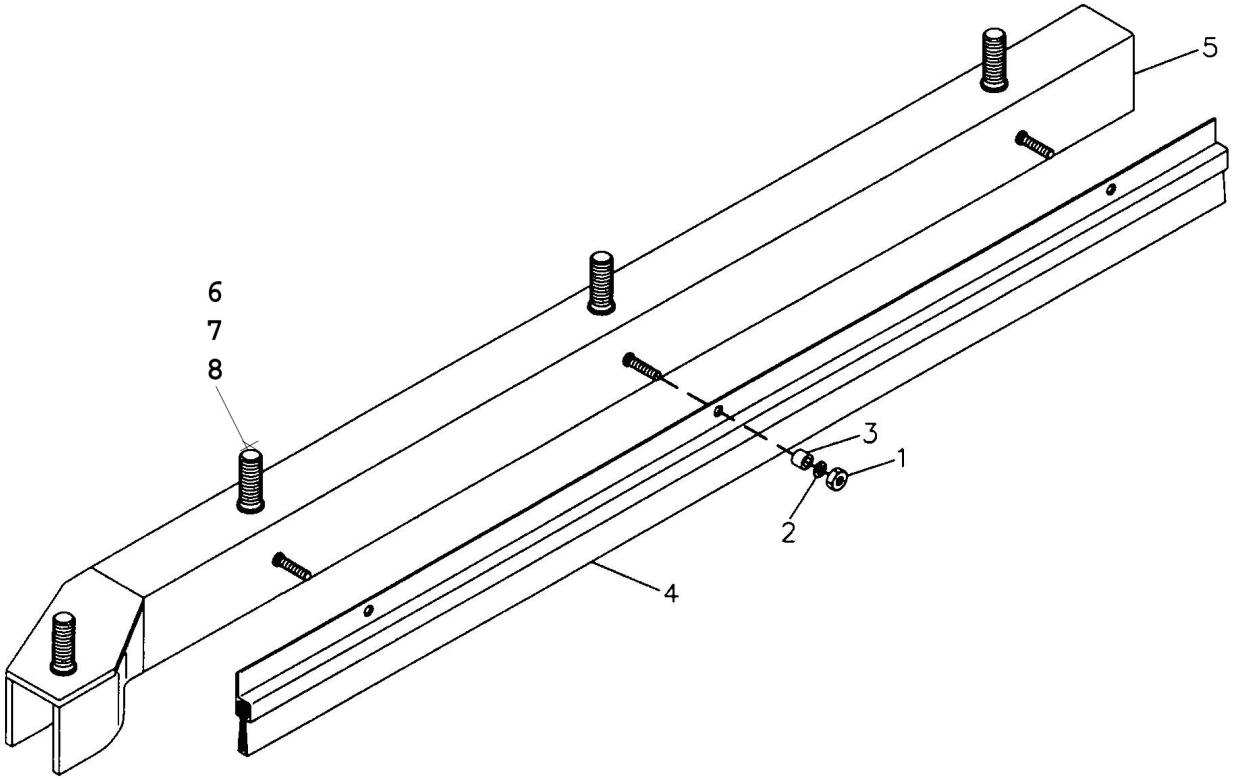


Figure 4-23 Roller Channel Assembly, RH, End Door

NOTE: ADDED ITEMS 6, 7, & 8 AS PER CFG 1143 REV 0

Roller Channel Assembly, RH, End Door (Fig. 4-23)

Section Figure Item	OEM P/N	P/N	OEM Code	Description	MBTA Code	U/M	Qty per Assy
04-023-	59631338	59631338	E0017	ROLLER CHANNEL ASSEMBLY, RH, END DOOR - SEE Figure 4-4 FOR NHA		EA	1
A	59631338-01	59631338-01	E0017	ROLLER CHANNEL ASSEMBLY, LH, END DOOR - SEE Figure 4-4 FOR NHA		EA	1
1	67113015-02	67113015-02	E0017	.NUT, HEX KEPS - NO 8-32 - ATT.PT		EA	3
2	67122110-05	67122110-05	E0017	.WASHER, PL - NO 8, 0.375 OD - ATT.PT X 0.032 THK - STL ZNP		EA	3
3	57411176-04	57411176-04	E0017	.SPACER		EA	3
4	58820383-04	58820383-04	E0017	.BRUSH SEAL ASSEMBLY		EA	1
5	59831005	59831005	E0017	.CHANNEL ASSEMBLY, RH		EA	1
5A	59831005-01	59831005-01	E0017	.CHANNEL ASSEMBLY, LH		EA	1
6	McMaster-Carr 91831A030			LOCK NUT, 5/16-18 Ny-Lok, s/stl ph 18-18		EA	8
7	McMaster-Carr 98370A017			FLAT WASHER, 5/16, s/stl ph 18-18		EA	8
8	McMaster-Carr 91007A632			LOCK WASHER, 5/16, s/stl ph 18-18		EA	10

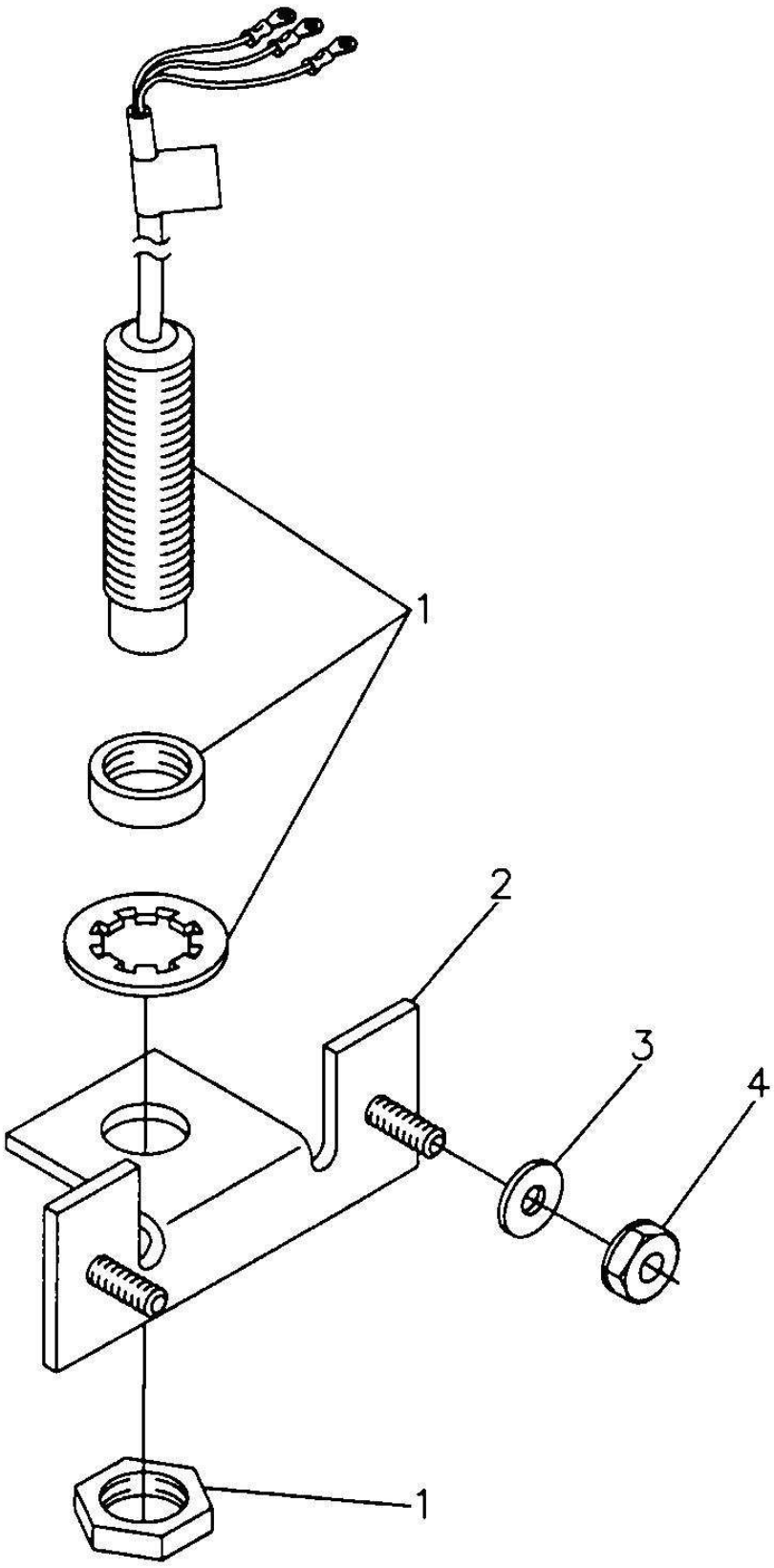


Figure 4-24 Sensor Assembly

Sensor Assembly (Fig. 4-24)

Section Figure Item	OEM P/N	P/N	OEM Code	Description	MBTA Code	U/M	Qty per Assy
04-024-	59620984	59620984	E0017	SENSOR ASSEMBLY - SEE Figure 4-4, Figure 4-26 FOR NHA		EA	1
1	59621060	59621060	E0017	.SENSOR ASSEMBLY		EA	1
2	59621059	59621059	E0017	.SENSOR BRACKET		EA	1
3	67122110-06	67122110-06	E0017	.WASHER, PL - NO 10, 0.438 OD - ATT.PT X 0.032 THK - STL ZNP		EA	2
4	67113015-03	67113015-03	E0017	.NUT, HEX KEPS - NO 10-32 - - ATT.PT STL ZNP		EA	2

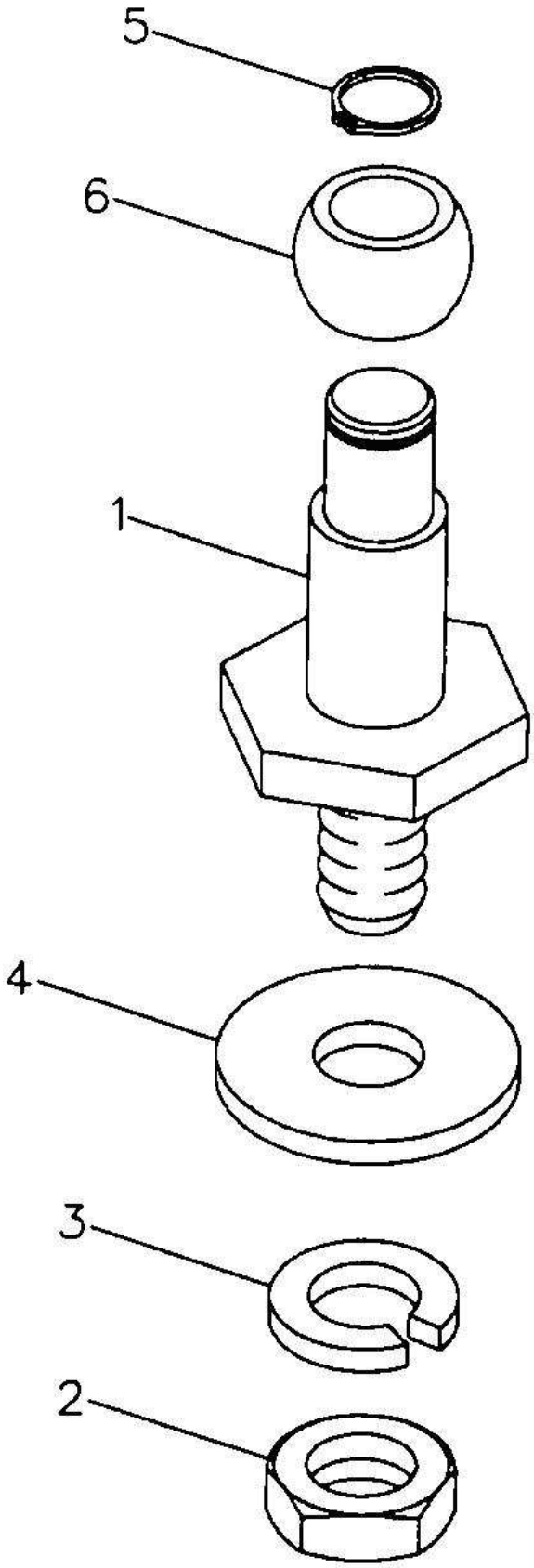


Figure 4-25 Bottom Pivot Assembly

Bottom Pivot Assembly (Fig. 4-25)

Section Figure Item	P/N	OEM P/N	OEM Code	Description	MBTA Code	U/M	Qty per Assy
04-025-	59621157	59621157	E0017	BOTTOM PIVOT ASSEMBLY - SEE Figure 4-4, Figure 4-26 FOR NHA		EA	1
1	59621157-01	59621157-01	E0017	.PIN (PART OF BOTTOM PIVOT ASSEMBLY)		EA	1
2			E0017	.NUT, HEX, JAM -1/2-20 – SSTL		EA	1
3			E0017	.LOCKWASHER, SPLIT -1/2, - ATT.PT 0.171 W X 0.125 THK - STL ZNP		EA	1
4	67123005-43	67123005-43	E0017	.WASHER, HARDENED		EA	1
5	67122005-46	67122005-46	E0017	.RETAINING RING, EXTERNAL		EA	1
6	58110700	58110700	E0017	.BEARING SPHERICAL		EA	1

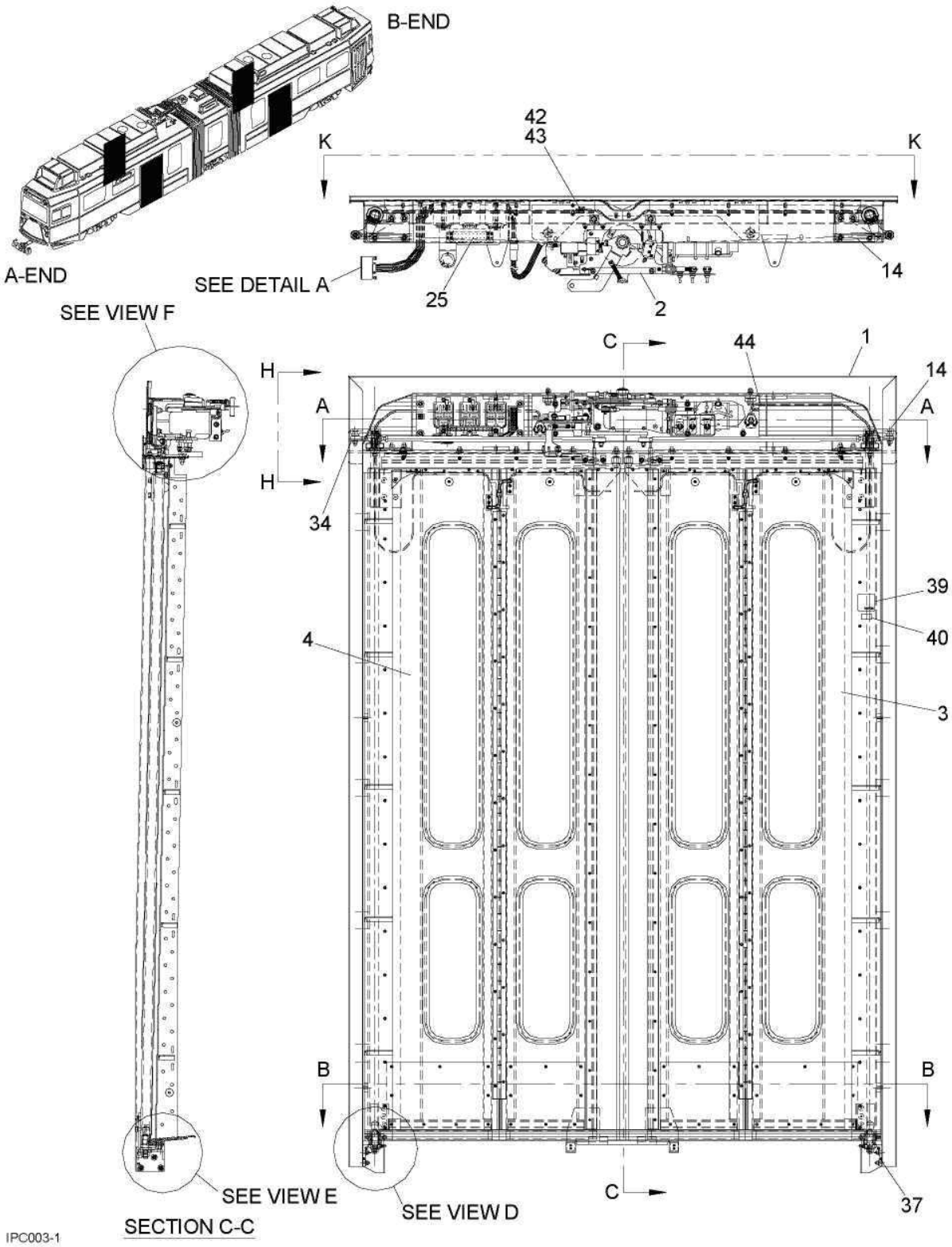
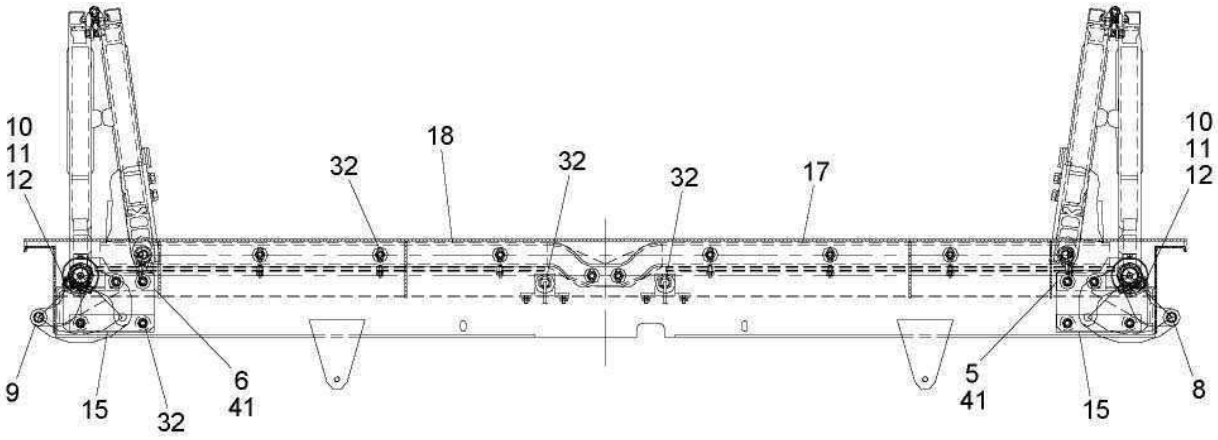
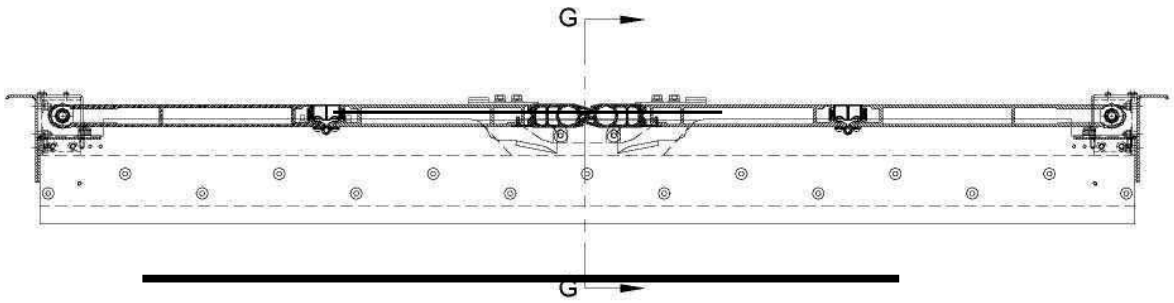


Figure 4-26 Door Module, Ctr Door (Sheet 1 of 3)

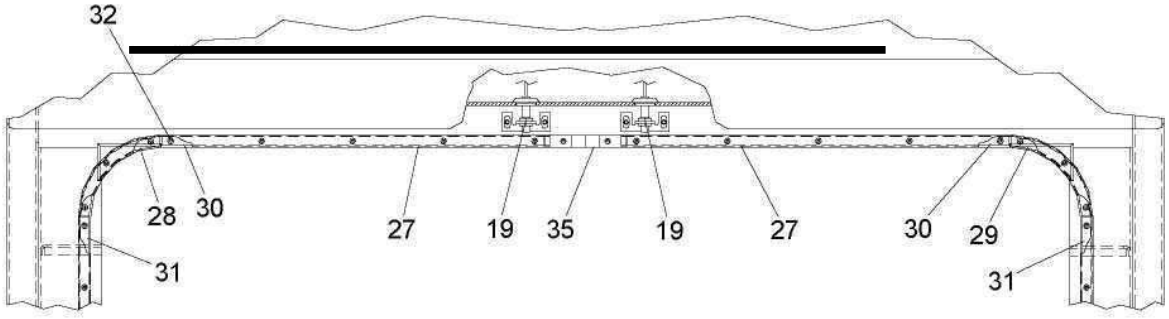


SECTION A-A

ADDED ITEM 45 & 46 AS PER WORK INSTRUCTIONS OF CFG 1165 REV 0



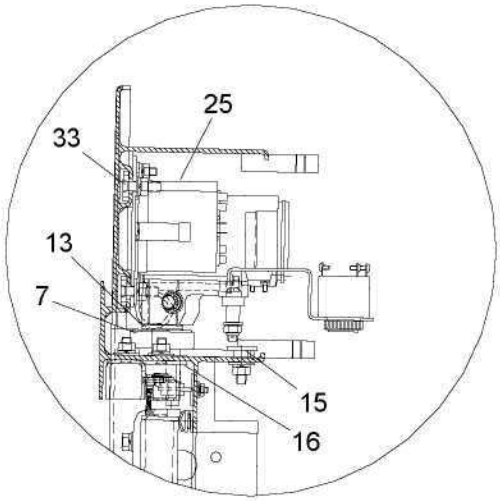
SECTION B-B



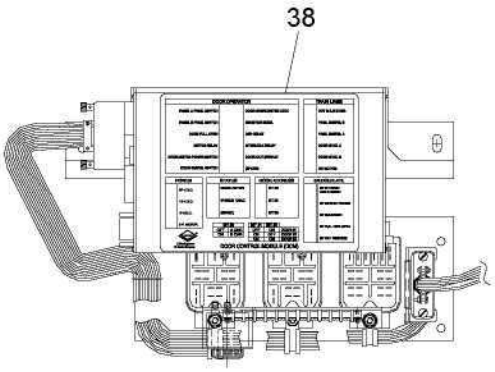
VIEW K-K
(DOORS REMOVED FOR CLARITY)

IPC003-2

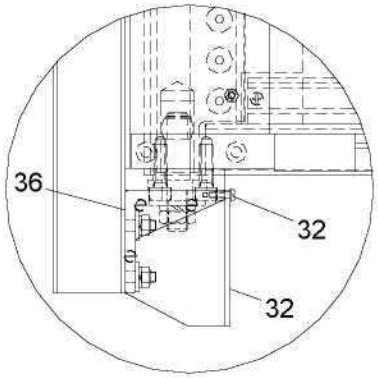
Figure 4-26 Door Module, Ctr Door (Sheet 2 of 3)



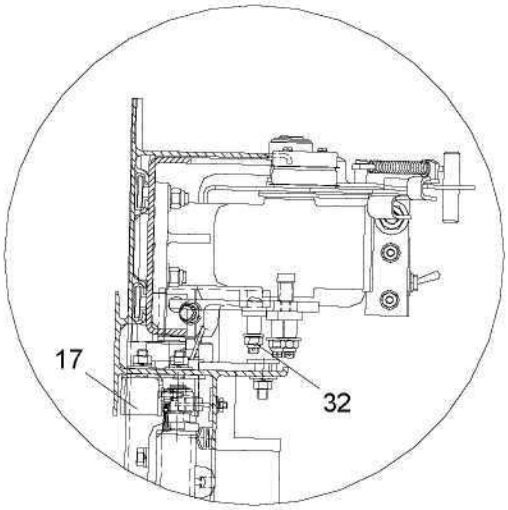
VIEW H



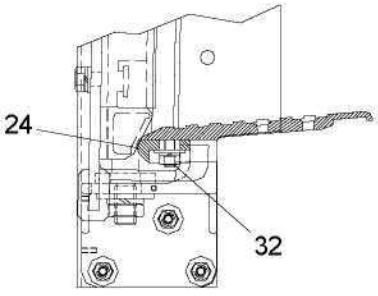
DETAIL A



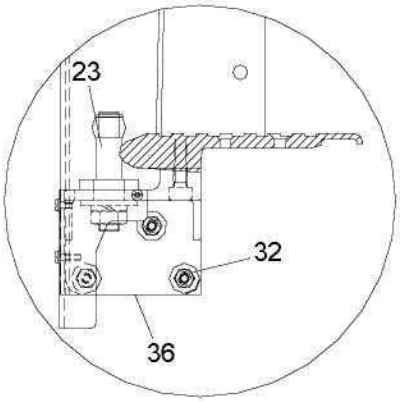
VIEW D



VIEW F



SECTION G-G



VIEW E

IPC002-3

Figure 4-26 Door Module, Ctr Door(Sheet 3 of 3)

Door Module, Ctr Door (Fig. 4-26)

SECTION, FIGURE, & INDEX NUMBER	PART NUMBER	BCF MGMT CODE	MFR CODE	DESCRIPTION	MBTA CODE	U/M	QTY
02-02	59566658			CENTER DOOR MODULE			REF
1	5966114000			FRAME ASSY. MODULE (CENTER)		EA	1
2	5966094100			OPERATOR ASSEMBLY - CENTER (Refer to Figure 2-14 for breakdown)		EA	1
3	5966042700			DOOR PANEL ASSY RH (Refer to Figure 2-21 for breakdown)		EA	1
4	5966046700			DOOR PANEL ASSY LH (Refer to Figure 2-22 for breakdown)		EA	1
5	5963624700			PLATE ASSY. BEARING RH		EA	1
6	5963624701			PLATE ASSY. BEARING LH		EA	1
7	5681018000			BEARING, BALL		EA	2
8	5963624600			LEVER ASSY. DOOR SHAFT RH (Refer to Figure 2-29 for breakdown)		EA	1
9	5963624601			LEVER ASSY. DOOR SHAFT LH (Refer to Figure 2-29 for breakdown)		EA	1
10	5601151801			SCREW SPECIAL		EA	2
11	5601151900			WEDGE		EA	2
12	5601152001			WEDGE		EA	2
13	5681030500			SPACER RD 1.01X1.375X.188 STL ZN MACH		EA	2
14	5822613047			ROD ASSEMBLY CONNECTING		EA	1
15	5961624800			PLATE MTG.		EA	2
16	5961624801			PLATE MTG.		EA	2
17	5963100300			CHANNEL ASSY-ROLLER(RH)		EA	1
17	5963133700			ROLLER CHANNEL ASSY. RH (Refer to Figure 2-31 for breakdown)		EA	1
18	5963100301			CHANNEL ASSY-ROLLER(LH)		EA	1
18	5963133701			ROLLER CHANNEL ASSY. LH (Refer to Figure 2-31 for breakdown)		EA	1
19	5962098400			SENSOR ASSY. (Refer to Figure 2-32 for breakdown)		EA	2
20	5962098401			SENSOR ASSY.		EA	1
21	5963115400			SEAL ASSY. BRUSH RH		EA	1
22	5963115401			SEAL ASSY. BRUSH LH		EA	2
23	5962115700			PIVOT ASSY. BOTTOM (Refer to Figure 2-37 for breakdown)		EA	1

CONTINUE>

Door Module, Ctr Door (Fig. 4-26)(contd.)

SECTION, FIGURE, & INDEX NUMBER	PART NUMBER	BCF MGMT CODE	MFR CODE	DESCRIPTION	MBTA CODE	U/M	QTY
02-02- 24	5962111300			WEDGE LOCKING		EA	1
25	5944769700			DOOR CONTROL ASSY. (Refer to Figure 2-06 for breakdown)		EA	1
25	5964131900			CONTROLLER & RELAY ASSY.		EA	25
25	5974665800			RELAY BRACKET ASSY. (Refer to Figure 2-12 for breakdown)		EA	2
27	5962115500			SEAL DOOR FACE		EA	1
27	5962139700			SEAL-FACE		EA	1
28	5963106100			RETAINER SEAL CORNER RH		EA	2
29	5963106101			RETAINER SEAL CORNER LH		EA	2
30	5963106200			RETAINER SEAL		EA	1
31	5963106201			RETAINER SEAL		EA	4
32	5961115600			KIT HARDWARE		EA	1
33	5962094500			BAR MTG.		EA	1
34	5963152600			ROD ASSY. CONNECTING (Refer to Figure 2-28 for breakdown)		EA	1
35	5961139600			SEAL-TRANSITION		EA	1
36	5973045500			BRACKET PIVOT		EA	1
37	5973045501			BRACKET PIVOT		EA	1
38	5973666300			CONTROLLER ASSY.		EA	1
39	9752193526			LABEL IDENT.		EA	2
40	9752192654			LABEL IDENT. (MA.CTR)		EA	1
40	9752192663			LABEL IDENT.		EA	1
41	5982050900			SEAL-BEARING BRACKET		EA	2
42	1851026800			MOUNT ADHESIVE BACKED		EA	1
43	5621647605			TIE CABLE S/LOCK .095X8.00 NYL WHT		EA	1
44	97510118-04			SLEEVING FLEXIBLE		EA	1
45	R13354116	R13354116	A0185	FILTER ASSEMBLY		EA	1
46	FQN14M25X03D			FAST ON CONNECTOR MALE, 16 AWG, 1/4", insulated, Burndy FQN14M25X03D		EA	2

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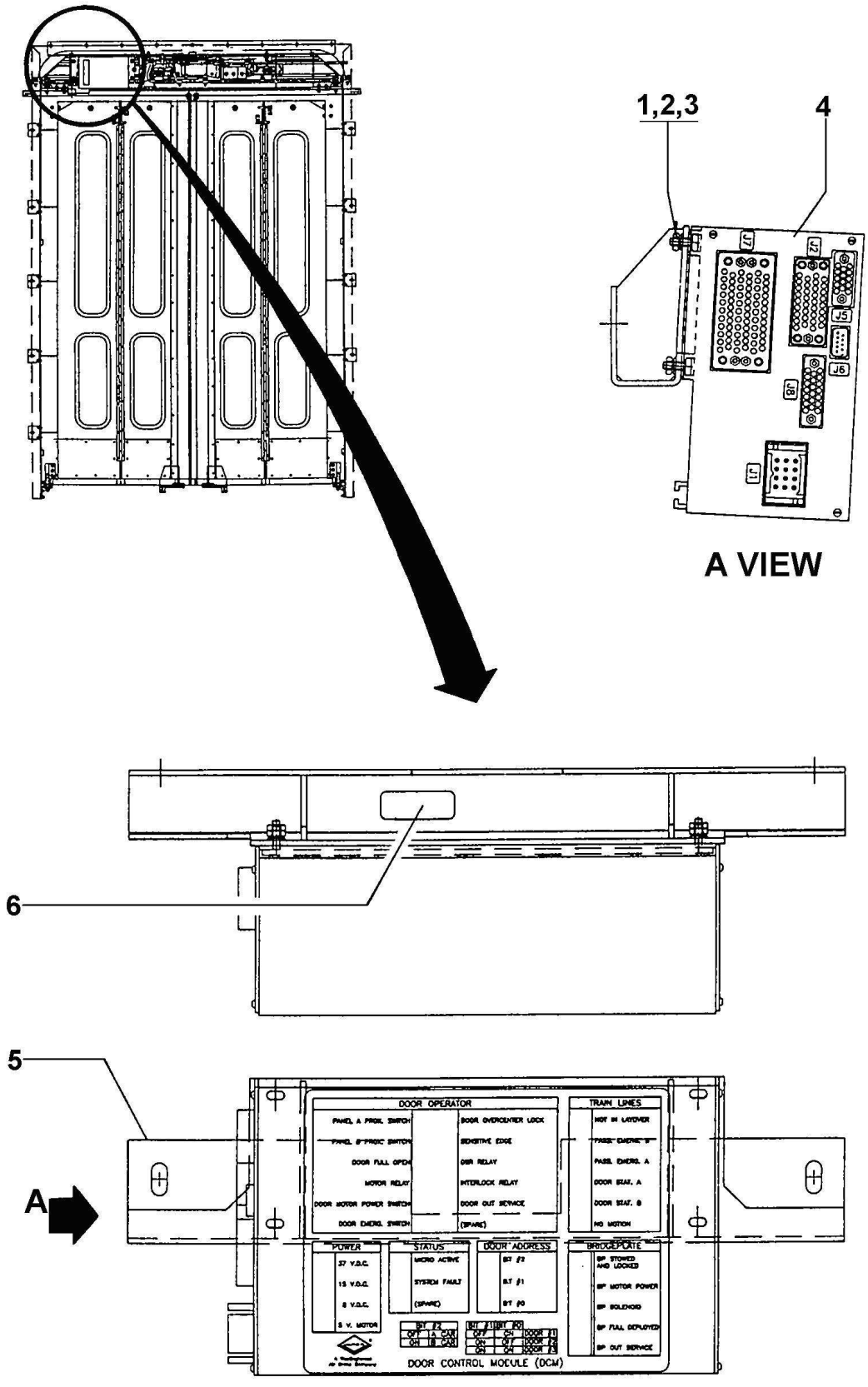

Figure 4-27 Controller Assembly, Center Door

Controller Assembly, Center Door (Fig. 4-27)

Section Figure Item	P/N	OEM P/N	OEM Code	Description	MBTA Code	U/M	Qty per Assy
04-027-	59736663	59736663	E0017	CONTROLLER ASSEMBLY, CENTER DOOR - SEE Figure 4-26 FOR NHA		EA	1
1	67123000-06	67123000-06	E0017	.NUT, HEX - NO 8-32 - STL ZNP - ATT.PT		EA	4
2	67122005-05	67122005-05	E0017	.LOCKWASHER, SPLIT - NO 8, - ATT.PT 0.055 W X 0.040 THK - STL ZNP		EA	4
3	67122110-05	67122110-05	E0017	.WASHER, PL - NO 8, 0.375 OD - ATT.PT X 0.032 THK - STL ZNP		EA	4
4	59447697	59447697	E0017	.DOOR CONTROLLER ASSY, CENTER DOOR - SEE Figure 4-28 FOR DETAIL		EA	1
5	59736664	59736664	E0017	.BRACKET ASSEMBLY		EA	1
6	97521945-18	97521945-18	E0017	.LABEL, IDENTIFICATION		EA	1

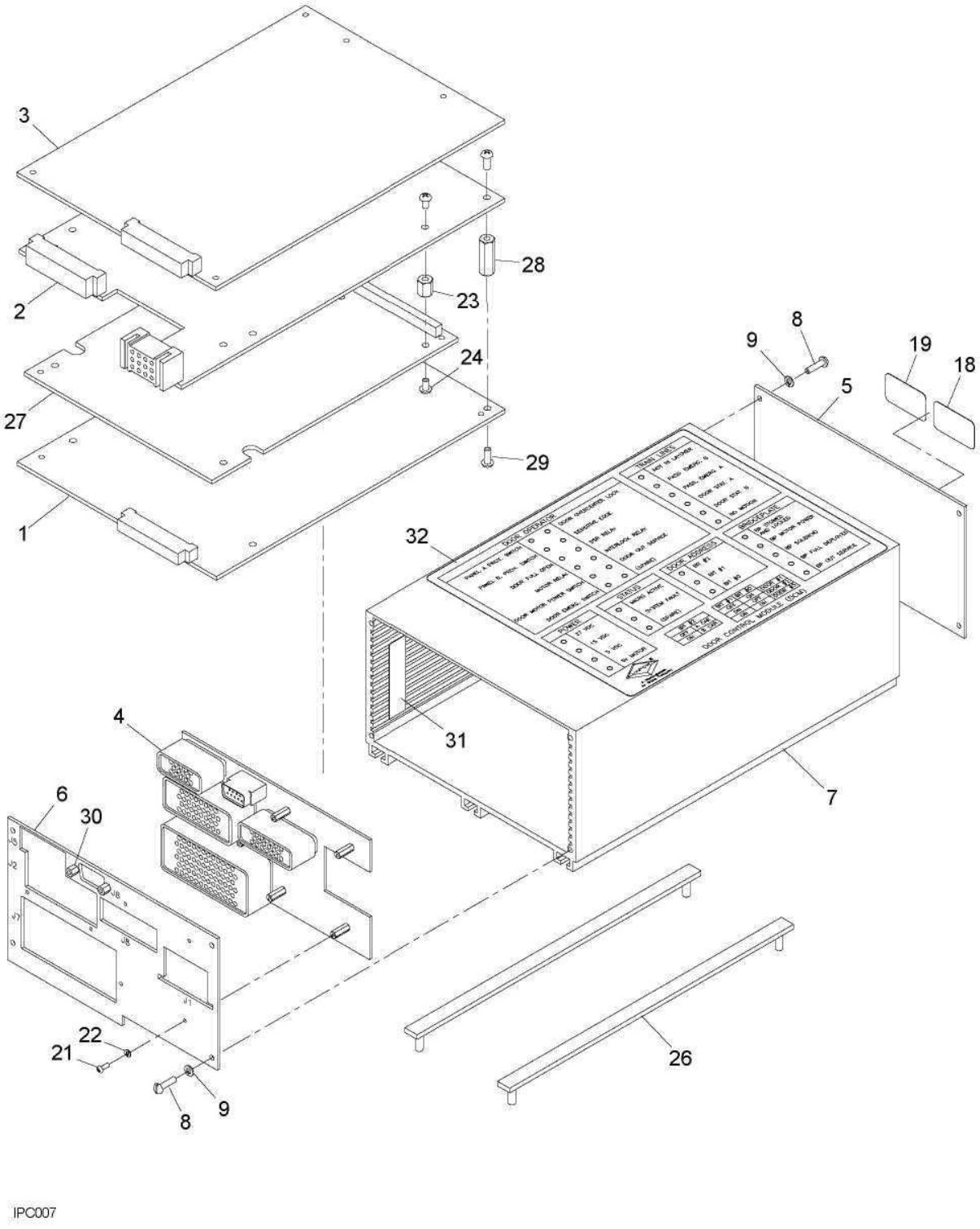

Figure 4-28 Door Controller Assy, Center Door

Door Controller Assy, Center Door (Fig. 4-28)

SECTION, FIGURE, & INDEX NUMBER	PART NUMBER	BCF MGMT CODE	MFR CODE	DESCRIPTION	MBTA CODE	U/M	QTY
02-06	5944769700			CONTROLLER, CENTER DOOR (Refer to Item 4, Figures 2-4 for NHA)			REF
1	5964141000			BOARD ASSY. MICRO PROCESS. (DCM)		EA	1
2	5964141100			BOARD ASSY. DRIVER (DCM)		EA	1
3	5964141200			BOARD ASSY. LED (DCM)		EA	1
4	5964141300			BOARD ASSY. INTERFACE (DCM)		EA	1
5	5982008800			END PLATE & PAD ASSY.		EA	1
6	5982009100			END PLATE & SCREEN ASSY.		EA	1
7	5983008700			BOX & LABEL ASSY.		EA	1
8	6712100227			SCR PAN HD REC 4-40 X.500LG		EA	8
9	6712200100			LK WASH EXT NO.4		EA	8
10	97W259 (6711000701)			ADHESIVE SCR LK ANAEROBIC		EA	0
11	PPN 4334			RIBBON CABLE 2" WITH RECEPTACLES		EA	2
18	97521929-39			HARDWARE REVISION LABEL		EA	1
19	97521929-23			SOFTWARE REVISION LABEL		EA	1
21	6712100202			SCR PAN HD REC 2-56X.250LG		EA	6
22	67122005			LOCKWASHER #2-0.035"Wx0.020"THK		EA	6
23	1611609153			POST MTG., 6-32X1/4"X0.375 F-F		EA	5
24	6712100255			SCR PAN HD REC 6-32 X.250LG		EA	10
26	5962131702			PAD MOUNTING		EA	2
27	5984017200			INPUT ADAPTER PCB ASSY.		EA	1
28	1611609174			POST MTG.		EA	6
29	6712100257			SCR PAN HD REC 6-32 X.375LG		EA	8
30	9523			SCR PAN HD SLTD 4-40X.250" LG		EA	2
31	200320301			BARCODE FOR DCM		EA	1
32	PPN 4423			NAMEPLATE FOR 59447697-03		EA	1

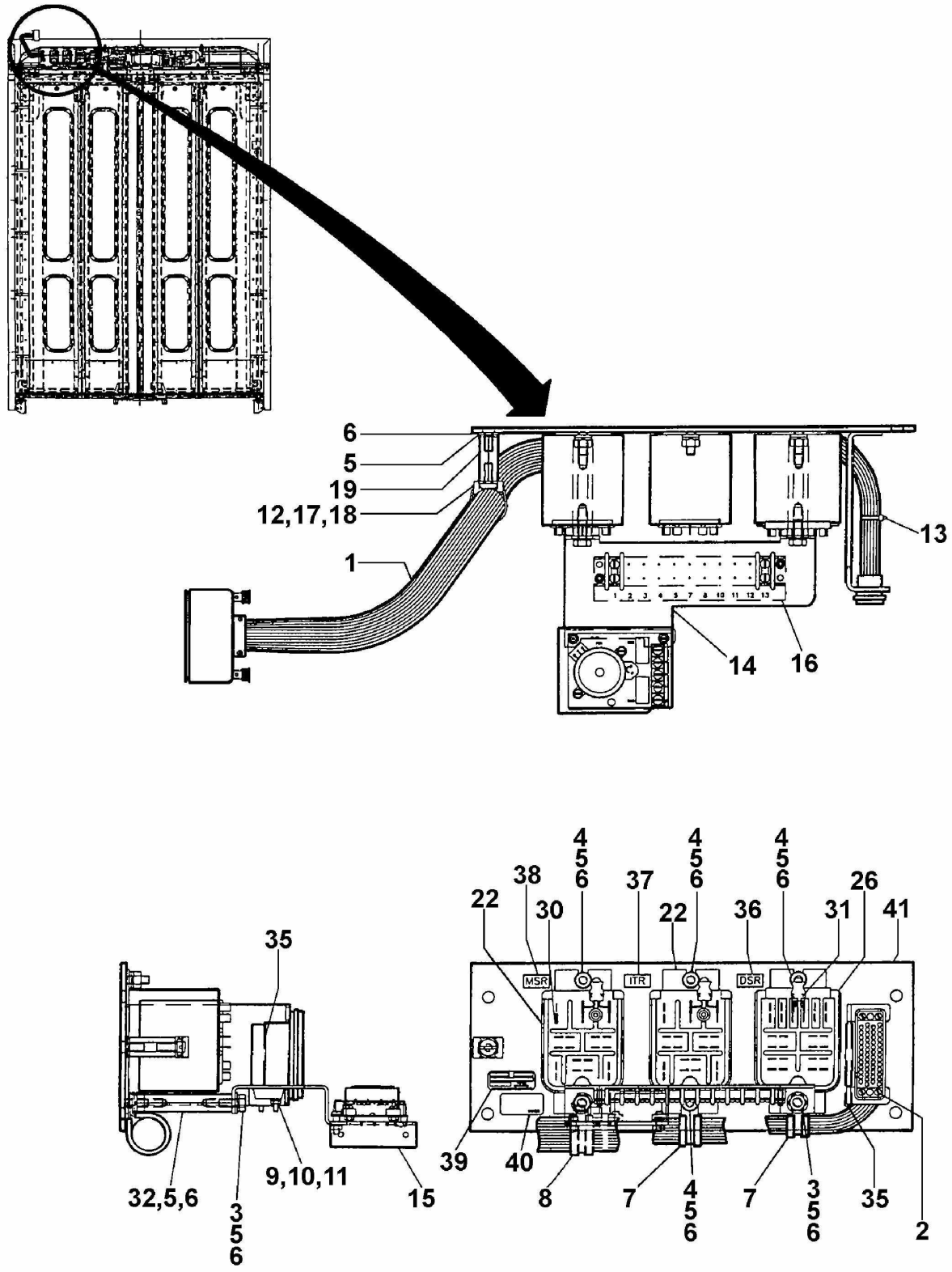

Figure 4-29 Relay Bracket Assembly, Center Door

Relay Bracket Assembly, Center Door (Fig. 4-29)

Section Figure Item	P/N	OEM P/N	OEM Code	Description	MBTA Code	U/M	Qty per Assy
04-029-	59746658	59746658	E0017	RELAY BRACKET ASSEMBLY, CENTER DOOR - SEE Figure 4-26 FOR NHA		EA	1
1	59730134	59730134	E0017	.WIRING HARNESS, CENTER DOOR		EA	1
2	6712101425	67121014-25	E0017	.SCREW, FIL HEAD - NO 4-40 X - ATT.PT 0.375 - STL ZNP		EA	4
3	6711101605	67111016-05	E0017	.SCREW, HEX SCH CAP -1/4-20 - ATT.PT X 0.75 - STL ZNP		EA	2
4	6712300009	67123000-09	E0017	.NUT, HEX -1/4-20 UNC - STL - ATT.PT ZNP		EA	4
5	6712200508	67122005-08	E0017	.LOCKWASHER, SPLIT -1/4, - ATT.PT 0.109 W X 0.062 THK - STL ZNP		EA	9
6	6712211007	67122110-07	E0017	.WASHER, PL -1/4, 0.625 OD X - ATT.PT 0.065 THK - STL ZNP		EA	9
7	476216484	47621648-04	E0017	.CLAMP, LOOP (CUSHIONED)		EA	2
8	4762164806	47621648-06	E0017	.CLAMP, LOOP (CUSHIONED)		EA	1
9	67123004	67123004	E0017	.NUT, HEX, JAM - NO 6-32 - STL - ATT.PT ZNP		EA	2
10	6712200101	67122001-01	E0017	.LOCKWASHER, EXT - NO 6, - ATT.PT 0.317 OD X 0.020 THK - STL ZNP		EA	2
11	6712211004	67122110-04	E0017	.WASHER, PL - NO 6, 0.312 OD - ATT.PT X 0.028 THK - STL ZNP		EA	2
12	5621647606	56216476-06	E0017	.HARNESS TIE		EA	2
13	5621647605	56216476-05	E0017	.HARNESS TIE		EA	5
14	59731183	59731183	E0017	.MOUNTING BRACKET		EA	1
15	59721189	59721189	E0017	.BRACKET AND PCB ASSEMBLY, CENTER DOOR		EA	1
16	9652003944	96520039-44	E0017	.MARKER STRIP		EA	1
17	6712100139	67121001-39	E0017	.SCREW, PAN HEAD -1/4-20 X - ATT.PT 0.750 - STL ZNP		EA	1
18	1751148203	17511482-03	E0017	TIE MOUNT		EA	1
19	1611609148	16116091-48	E0017	.MOUNTING POST		EA	1
20				DELETED			
21				DELETED			
22	3753011723	37530117-23	E0017	.RELAY, CRITICAL CIRCUIT (3 POLE)		EA	2
23				DELETED			

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Relay Bracket Assembly, Center Door (Fig. 4-29)

Section Figure Item	P/N	OEM P/N	OEM Code	Description	MBTA Code	U/M	Qty per Assy
04-029- 24				DELETED			
25				DELETED			
26	3753165000	37531650	E0017	.RELAY, CRITICAL CIRCUIT (4 FORM C)		EA	1
27				DELETED			
28				DELETED			
29				DELETED			
30	58710125	58710125	E0017	.FASTON TAB CAP		EA	10
31	9861002901	98610029-01	E0017	.VARISTOR ASSEMBLY		EA	3
32	1611609171	16116091-71	E0017	.MOUNTING POST		EA	2
33				DELETED			
34				DELETED			
35	57716871	57716871	E0017	.GROMMET		EA	1
36	5911014621	59110146-21	E0017	.LABEL, IDENTIFICATION		EA	1
37	5952020540	59520205-40	E0017	.LABEL, IDENTIFICATION		EA	1
38	5952020541	59520205-41	E0017	.LABEL, IDENTIFICATION		EA	1
39	9752194076	97521940-76	E0017	.LABEL, IDENTIFICATION		EA	1
40	9752192662	97521926-62	E0017	.LABEL, IDENTIFICATION		EA	1
41	59726659	59726659	E0017	.BRACKET ASSEMBLY (WELDED)		EA	1

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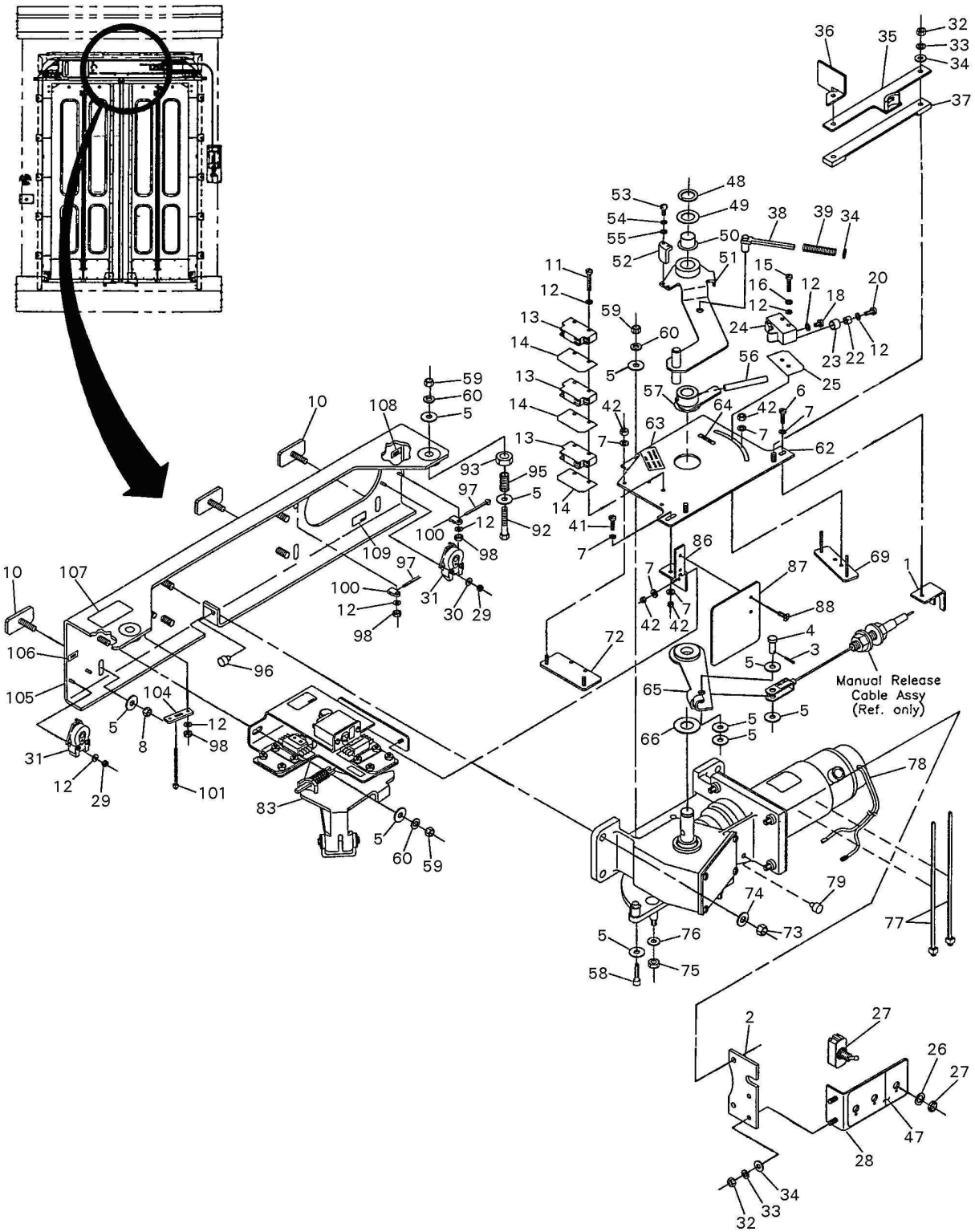

Figure 4-30 Door Operator, Center Door

Door Operator, Center Door (Fig. 4-30)

Section Figure Item	P/N	OEM P/N	OEM Code	Description	MBTA Code	U/M	Qty per Assy
04-030-	59660941	59660941	E0017	DOOR OPERATOR, CENTER DOOR - SEE Figure 4-12, Figure 4-26 FOR NHA		EA	1
1	59621366	59621366	E0017	.SUPPORT BRACKET		EA	1
2	59611384	59611384	E0017	.CABLE MOUNTING BRACKET		EA	1
3	67124005-09	67124005-09	E0017	.PIN, COTTER - 0.094 D X 1.00 - ATT.PT LG - STL ZNP		EA	1
4	17511373-03	17511373-03	E0017	.PIN, CLEVIS - 5/16 X 0.66 LG - - ATT.PT STL ZPL		EA	1
5	67122110-08	67122110-08	E0017	.WASHER, PL - 5/16, 0.688 OD X - ATT.PT 0.065 THK - STL ZNP		EA	23
6	67121001-25	67121001-25	E0017	.SCREW, SLTD PAN HD - NO - ATT.PT 10-32 X 0.44-STL ZNP		EA	1
7	67122110-06	67122110-06	E0017	.WASHER, PL - NO 10, 0.438 OD - ATT.PT X 0.032 THK – STL ZNP		EA	8
8	56710106-17	56710106-17	E0017	.NUT, SELF-LOCKING - 5/16-18 - - ATT.PT STL ZNP		EA	5
9				DELETED			
10	59620945	59620945	E0017	.MOUNTING BAR		EA	5
11	67121004-71	67121004-71	E0017	.SCREW, PHD SLTD SEM - NO - ATT.PT 6-32 X 1.25 - STL ZNP		EA	2
12	67122110-04	67122110-04	E0017	.WASHER, PL - NO 6, 0.312 OD X 0.028 THK - STL ZNP		EA	16
13	58920276-04	58920276-04	E0017	.SWITCH		EA	3
14	58110850-02	58110850-02	E0017	.INSULATOR, SWITCH		EA	3
15	67111201-02	67111201-02	E0017	.SCREW, SPECIAL, PHD - 32 X - ATT.PT 1.12-STLZNP		EA	2
16	67122001-01	67122001-01	E0017	.LOCKWASHER, EXT - NO 6, - ATT.PT 0.317 OD X 0.020 THK - STL ZNP		EA	2
17				DELETED			
18	67121004-56	67121004-56	E0017	.SCREW, PHD SLTD SEM - NO - ATT.PT 6-32 X 0.31 - STL ZNP		EA	3
19				DELETED			
20	67121004-61	67121004-61	E0017	.SCREW, PHD SLTD SEM - NO - ATT.PT 6-32 X 0.75 - STL ZNP		EA	1
21				DELETED			
22	57411176-03	57411176-03	E0017	.SPACER		EA	1
23	96326010-31	96326010-31	E0017	.TUBING, INSULATING		EA	1
24	57510235	57510235	E0017	.LEVER SWITCH		EA	1
25	58110850	58110850	E0017	.INSULATOR, SWITCH		EA	1
26	19210928	19210928	E0017	.LOCKING RING		EA	3
27	47610098	47610098	E0017	TOGGLE SWITCH - ATT.PT		EA	3

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Door Operator, Center Door (Fig. 4-30)

Section Figure Item	P/N	OEM P/N	OEM Code	Description	MBTA Code	U/M	Qty per Assy
04-030- 28	59621367	59621367	E0017	.SWITCH MOUNTING BRACKET CENTER DOORS		EA	1
29	67113015-01	67113015-01	E0017	.NUT, HEX KEPS - ATT.PT		EA	4
30				DELETED			
31	57410099-02	57410099-02	E0017	.SWITCH, SENSITIVE EDGE		EA	2
32	67123000-09	67123000-09	E0017	.NUT, HEX -1/4-20 UNC - STL - ATT.PT ZNP		EA	6
33	67122005-08	67122005-08	E0017	.LOCKWASHER, SPLIT-1/4, -ATT.PT 0.109 W X 0.062 THK - STL ZNP		EA	6
34	67122110-07	67122110-07	E0017	.WASHER, PL -1/4, 0.625 OD X - ATT.PT 0.065 THK - STL ZNP		EA	5
35	59630961	59630961	E0017	.TOGGLE BRACKET ASSEMBLY		EA	2
36	59820212	59820212	E0017	.PLATE ASSEMBLY		EA	1
37	59621364	59621364	E0017	.SLIDE BAR		EA	1
38	56216311-06	56216311-06	E0017	TOGGLE		EA	1
39	58110870	58110870	E0017	.SPRING, COMPRESSION HELICAL		EA	1
40				DELETED			
41	67121001-27	67121001-27	E0017	.SCREW, PAN HEAD - NO 10-32 - ATT.PT X 0.625 - STL ZNP		EA	1
42	67113015-03	67113015-03	E0017	.NUT, HE X KEPS - NO 10-32 - - ATT.PT STL ZNP		EA	6
43				DELETED			
44				DELETED			
45				DELETED			
46				DELETED			
47	59621368	59621368	E0017	.LABEL, INDICATING		EA	1
48	96520020-48	96520020-48	E0017	.RETAINING RING, EXTERNAL - ATT.PT		EA	1
49	56910436-01	56910436-01	E0017	.WASHER, THRUST		EA	2
50	57110105-27	57110105-27	E0017	.FLANGED BEARING		EA	1
51	59630963	59630963	E0017	.EMERGENCY HANDLE		EA	1
52	59810213	59810213	E0017	.CAM		EA	1
53	67121000-29	67121000-29	E0017	.SCREW, PHD SLTD - NO 4-40 X - ATT.PT 0.75 - STL ZNP		EA	2
54	67122005-02	67122005-02	E0017	.LOCKWASHER, SPLIT - NO 4, - ATT.PT 0.040 W X 0.025 THK - STL ZNP		EA	2
55	67122110-02	67122110-02	E0017	.WASHER, PL - NO 4, 0.281 OD - ATT.PT X 0.025 THK - STL ZNP		EA	2
56	67124000-54	67124000-54	E0017	.PIN, 'SPIROL', HEAVY - 0.312 X - ATT.PT 2.50 LG		EA	1
57	59720083	59720083	E0017	.SWITCH CAM		EA	1
58	67111016-21	67111016-21	E0017	.SCREW, HEX SCH CAP - - ATT.PT 5/16-18 X 0.88- STL ZNP		EA	2

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Door Operator, Center Door (Fig. 4-30)

Section Figure Item	P/N	OEM P/N	OEM Code	Description	MBTA Code	U/M	Qty per Assy
04-030-59	67123000-11	67123000-11	E0017	.NUT, HEX - 5/16-18 UNC - STL - ATT.PT ZNP		EA	6
60	67122005-09	67122005-09	E0017	.LOCKWASHER, SPLIT - 5/16, - ATT.PT 0.125 W X 0.078 THK - STL ZNP		EA	6
61				DELETED			
62	59746655	59746655	E0017	.SWITCH AND LEVER BRACKET		EA	1
63	97521942-01	97521942-01	E0017	.LABEL, IDENTIFICATION		EA	1
64	97521930-01	97521930-01	E0017	.LABEL, IDENTIFICATION		EA	1
65	59630969	59630969	E0017	.LEVER ASSEMBLY		EA	1
66	59610436-01	59610436-01	E0017	.WASHER, THRUST		EA	1
67				DELETED			
68				DELETED			
69	59720084	59720084	E0017	.PLATE ASSEMBLY SWITCH		EA	1
70				DELETED			
71				DELETED			
72	59720212	59720212	E0017	.PLATE ASSEMBLY, SWITCH		EA	1
73	56710106-11	3/8-16 UNC ANSI B18.2.2aN	Z9009	.NUT, HEX - 3/8-16 UNC ANSI - ATT.PT B18.2.2 - STL ZNP		EA	4
74	67122110-09	67122110-09	E0017	.WASHER, PL - 3/8, 0.813 OD X - ATT.PT 0.065 THK - STL ZNP		EA	4
75	56710106-13	56710106-13	E0017	.NUT, LOCKING - 5/16-24 - ATT.PT		EA	2
76	67122110-41	67122110-41	E0017	.WASHER, PL - 5/16, 0.065 OD X - ATT.PT 0.065 THK - STL ZNP		EA	2
77	56216476-02	56216476-02	E0017	.HARNESS TIE		EA	2
78	59640952	59640952	E0017	.MOTOR AND GEAR HOUSING ASSEMBLY - SEE Figure 4-15 FOR DETAIL		EA	4
79	56316236	56316236	E0017	.BUMPER		EA	2
80				DELETED			
81				DELETED			
82				DELETED			
83	59640946	59640946	E0017	.DOOR OUT-OF-SERVICE ASSEMBLY - SEE Figure 4-14 FOR DETAIL		EA	1
84				DELETED			
85				DELETED			
86	59621365	59621365	E0017	.SUPPORT BRACKET		EA	1
87	59716652	59716652	E0017	.PLATE, BACKING		EA	1
88	67121044-01	67121044-01	E0017	.SCREW, FLAT REC HD - NO - ATT.PT 8-32 X 0.31 - SSTL		EA	2
89				DELETED			
90				DELETED			
91				DELETED			
92	67111017-39	67111017-39	E0017	.SCREW, HEX SCH CAP - - ATT.PT 5/16-18 X 1.75-STL ZNP		EA	2

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Door Operator, Center Door (Fig. 4-30)

Section Figure Item	P/N	OEM P/N	OEM Code	Description	MBTA Code	U/M	Qty per Assy
04-030-93	67123005-32	67123005-32	E0017	.NUT, HEX, JAM - 3/4-16 - STL - ATT.PT ZNP		EA	2
94				DELETED			
95	59610944	59610944	E0017	.INSERT ROD		EA	2
96				DELETED			
97	56216476-03	56216476-03	E0017	.HARNESS TIE		EA	2
98	67113015-05	67113015-05	E0017	.NUT, HEX KEPS - NO 6-32 - STL - ATT.PT ZNP		EA	4
99				DELETED			
100	570100229	570100229	E0017	.HARNESS CLIP		EA	2
101	56216476-04	56216476-04	E0017	.HARNESS TIE		EA	2
102				DELETED			
103				DELETED			
104	57511770	57511770	E0017	.PLATE, HARNESS TIE		EA	1
105	59646250	59646250	E0017	.BASE PLATE ASSEMBLY		EA	1
106	57816458-11	57816458-11	E0017	.LABEL, IDENTIFICATION		EA	1
107	97521941	97521941	E0017	.LABEL, IDENTIFICATION		EA	1
108	57816458-12	57816458-12	E0017	.LABEL, IDENTIFICATION		EA	1
109	97521926-53	97521926-53	E0017	.LABEL, IDENTIFICATION (DO, CTR)		EA	1

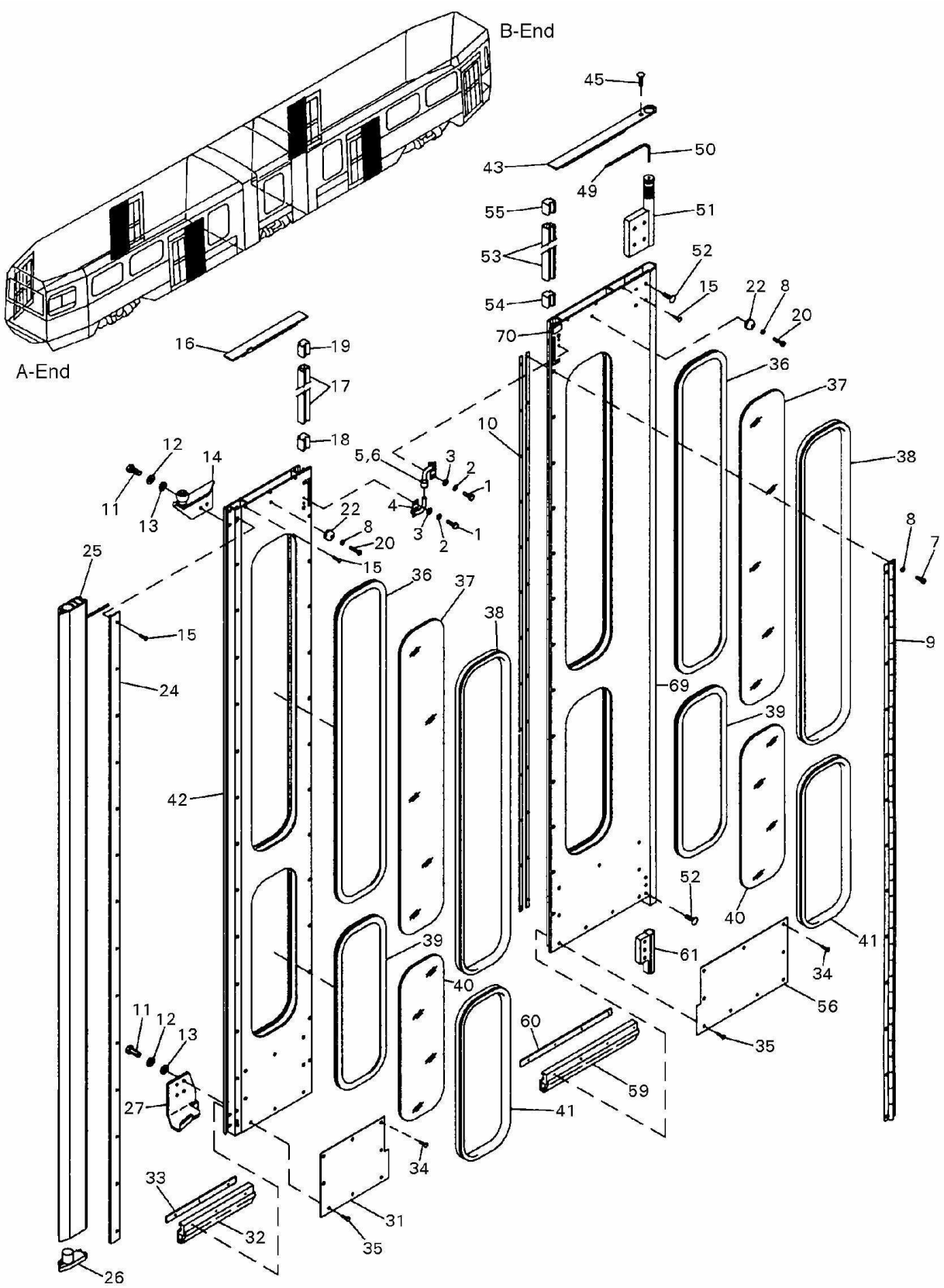

Figure 4-31 Door Panel Assy, Low Floor, RH

Door Panel Assy, Low Floor, RH (Fig. 4-31)

Section Figure Item	P/N	OEM P/N	OEM Code	Description	MBTA Code	U/M	Qty per Assy
04-031-	59660427	59660427	E0017	DOOR PANEL ASSY, LOW FLOOR, RH - SEE Figure 4-26 FOR NHA		EA	1
1	67121083-02	67121083-02	E0017	.SCREW, PAN HD REC - NO - ATT.PT 10-32 X 0.75 - STL ZNP		EA	4
2	67122005-40	67122005-40	E0017	.LOCKWASHER, SPLIT - NO 10, - ATT.PT 0.062 W X 0.047 THK - STL ZNP		EA	4
3	67122111-06	67122111-06	E0017	.WASHER, PL - NO 10, 0.44 OD - ATT.PT X 0.050 THK - STL ZNP		EA	4
4	58436151-02	58436151-02	E0017	.TRANSFER TUBE GUIDE ASSEMBLY		EA	1
5	58436151-03	58436151-03	E0017	.TRANSFER TUBE GUIDE ASSEMBLY		EA	1
6	58510416	58510416	E0017	.ALIGNMENT SLEEVE		EA	1
7	67121083-11	67121083-11	E0017	.SCREW, PAN HD REC - NO - ATT.PT 8-32 X 5/8 - STL ZNP		EA	28
8	67122005-39	67122005-39	E0017	.LOCKWASHER, SPLIT - NO 8, - ATT.PT 0.055 W X 0.040 THK - STL ZNP		EA	30
9	59630901	59630901	E0017	.HINGE		EA	1
10	59621503	59621503	E0017	.TAPPING STRIP		EA	2
11	67121094-26	67121094-26	E0017	.SCREW, HEX SCH CAP - - ATT.PT 5/16-18 X 1.25- STL ZNP		EA	8
12	67122005-09	67122005-09	E0017	.LOCKWASHER, SPLIT - 5/16, - ATT.PT 0.125 W X 0.078 THK - STL ZNP		EA	8
13	67122110-08	67122110-08	E0017	.WASHER, PL - 5/16, 0.688 OD X - ATT.PT 0.065 THK - STL ZNP		EA	8
14	59630426	59630426	E0017	.ROLLER BRACKET ASSEMBLY, RH - SEE Figure 4-19 **Roller Bracket Assembly, RH** FOR DETAIL		EA	1
15	67121043-39	67121043-39	E0017	.SCREW, FLAT REC HD - NO - ATT.PT 6-32 X 0.62 - STL ZNP		EA	20
16	59630904	59630904	E0017	.PANEL CAP		EA	1
17	59630908	59630908	E0017	.BIPARTING SEAL		EA	1
18	59631510	59631510	E0017	.PLUG, BIPARTING SEAL		EA	1
19	59510929	59510929	E0017	.DOOR FRAME CAP		EA	1
20	67121083-15	67121083-15	E0017	.SCREW, PAN HD REC - NO - ATT.PT 8-32 X 0.75 - STL ZNP		EA	2
21				DELETED			
22	57310510-03	57310510-03	E0017	.RECESSED BUMPER		EA	2
23				DELETED			
24	59620902	59620902	E0017	.EDGE RETAINER		EA	1

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Door Panel Assy, Low Floor, RH (Fig. 4-31)

Section Figure Item	P/N	OEM P/N	OEM Code	Description	MBTA Code	U/M	Qty per Assy
04-031-25	58336512-06	58336512-06	E0017	.SENSITIVE EDGE ASSEMBLY		EA	1
26	59631509	59631509	E0017	.PLUG, SENSITIVE EDGE		EA	1
27	59631485	59631485	E0017	.GUIDE BRACKET		EA	1
28				DELETED			
29				DELETED			
30				DELETED			
31	59620910-01	59620910-01	E0017	.KICK PLATE, LH		EA	1
32	59631508	59631508	E0017	.BOTTOM SEAL		EA	1
33	59621523-01	59621523-01	E0017	.TAPPING PAD		EA	1
34	67121044-05	67121044-05	E0017	.SCREW, FLAT REC HD - NO - ATT.PT 8-32 X 0,62 - STL ZNP		EA	10
35	67121044-07	67121044-07	E0017	.SCREW, FLAT REC HD - NO - ATT.PT 8-32 X 0.88 - STL ZNP		EA	7
36	59630907	59630907	E0017	.WINDOW SEAL, UPPER OUTSIDE		EA	2
37	59630906	59630906	E0017	.WINDOW GLASS, UPPER		EA	2
38	59631506	59631506	E0017	.WINDOW SEAL, UPPER INSIDE		EA	2
39	59630907-01	59630907-01	E0017	.WINDOW SEAL, LOWER OUTSIDE		EA	2
40	59630906-01	59630906-01	E0017	.WINDOW GLASS, LOWER		EA	2
41	59631506-01	59631506-01	E0017	.WINDOW SEAL, LOWER INSIDE		EA	2
42	59640899	59640899	E0017	.DOOR PANEL, LH, W/RIVETS, CENTER		EA	1
43	59630903	59630903	E0017	.PANEL CAP		EA	1
44				DELETED			
45	67121091-13	67121091-13	E0017	.SCREW, FLAT REC HD - NO - ATT.PT 8-32 X 0.50 - STL ZNP		EA	1
46				DELETED			
47				DELETED			
48				DELETED			
49	57410248	57410248	E0017	.CONNECTING FITTING, NYLON		EA	2
50	57410247-06	57410247-06	E0017	.TUBING			AR
51	59630425	59630425	E0017	.STUB SHAFT AND BRACKET ASSEMBLY		EA	1
52	67111045-09	67111045-09	E0017	.SCREW, FLAT HD - 5/16-18 X - ATT.PT 1.00 - STL ZNP		EA	7
53	59630908-01	59630908-01	E0017	.BIPARTING SEAL		EA	1
54	59631510-01	59631510-01	E0017	.PLUG, BIPARTING SEAL		EA	1
55	59510929-01	59510929-01	E0017	.DOOR FRAME CAP		EA	1
56	59620909	59620909	E0017	.KICK PLATE, RH		EA	1
57				DELETED			
58				DELETED			

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Door Panel Assy, Low Floor, RH (Fig. 4-31)

Section Figure Item	P/N	OEM P/N	OEM Code	Description	MBTA Code	U/M	Qty per Assy
04-031- 59	59631507	59631507	E0017	.BOTTOM SEAL		EA	1
60	59621523	59621523	E0017	.TAPPING PAD		EA	1
61	59630424	59630424	E0017	.PIVOT BRACKET		EA	1
62				DELETED			
63				DELETED			
64				DELETED			
65				DELETED			
66				DELETED			
67				DELETED			
68				DELETED			
69	59640898	59640898	E0017	.DOOR PANEL, LH, W/RIVETS, HINGED		EA	1
70	9752194088	9752194088	E0017	.LABEL, IDENTIFICATION		EA	1

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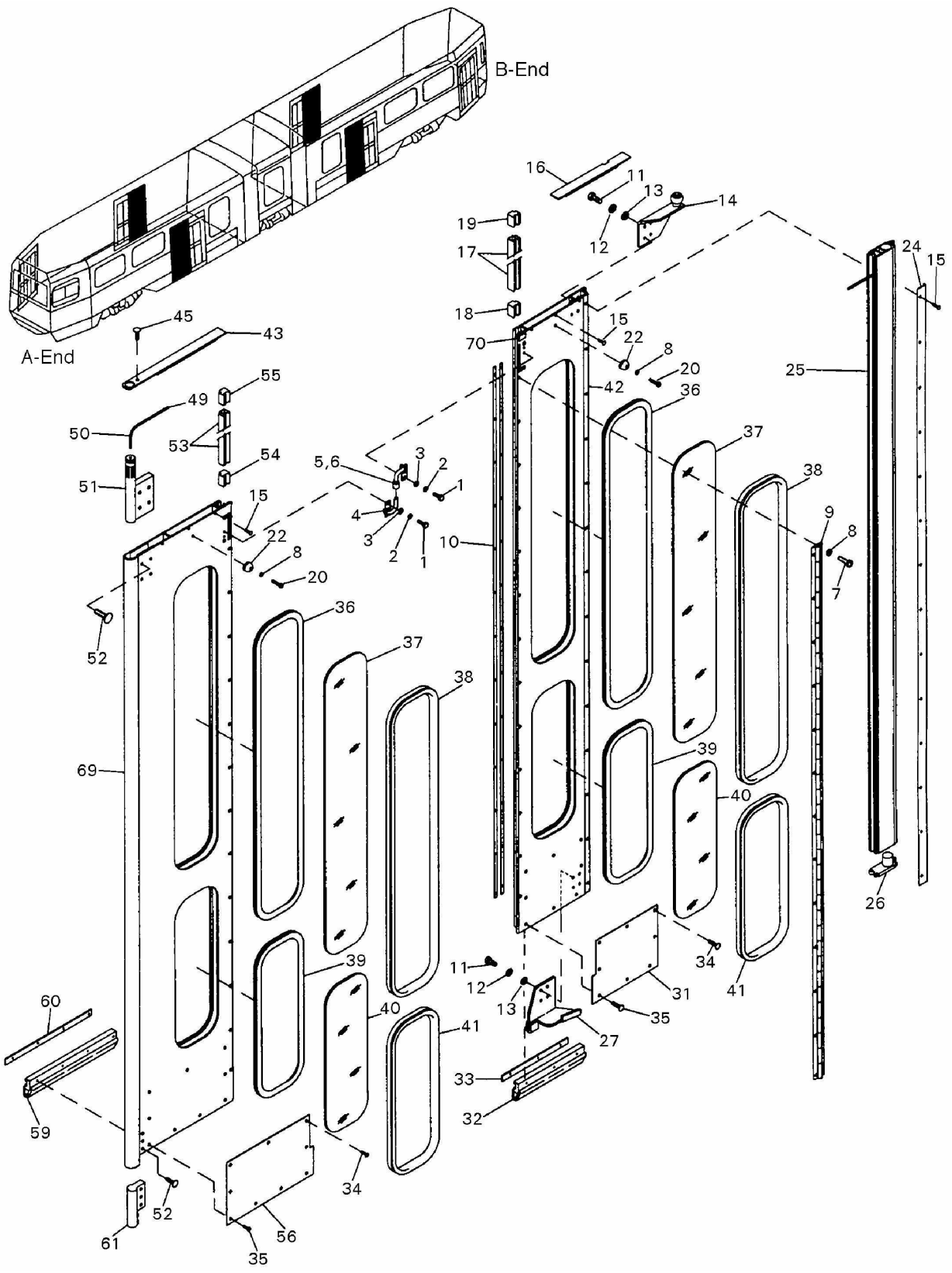

Figure 4-32 Door Panel Assy, Low Floor, LH

Door Panel Assy, Low Floor, LH (Fig. 4-32)

Section Figure Item	P/N	OEM P/N	OEM Code	Description	MBTA Code	U/M	Qty per Assy
04-032-	59660467	59660467	E0017	DOOR PANEL ASSY, LOW FLOOR, LH - SEE Figure 4-26 FOR NHA		EA	1
1	67121083-02	67121083-02	E0017	.SCREW, PAN HD REC - NO - ATT.PT 10-32 X 0.75-STL ZNP		EA	4
2	67122005-40	67122005-40	E0017	.LOCKWASHER, SPLIT - NO 10, - ATT.PT 0.062 W X 0.047 THK - STL ZNP		EA	4
3	67122111-06	67122111-06	E0017	.WASHER, PL - NO 10, 0.44 OD - ATT.PT X 0.050 THK - STL ZNP		EA	4
4	58436151-02	58436151-02	E0017	.TRANSFER TUBE GUIDE ASSEMBLY		EA	1
5	58436151-03	58436151-03	E0017	.TRANSFER TUBE GUIDE ASSEMBLY		EA	1
6	58510416	58510416	E0017	.ALIGNMENT SLEEVE		EA	1
7	67121083-11	67121083-11	E0017	.SCREW, PAN HD REC - NO - ATT.PT 8-32 X 5/8 - STL ZNP		EA	28
8	67122005-39	67122005-39	E0017	.LOCKWASHER, SPLIT - NO 8, - ATT.PT 0.055 W X 0.040 THK - STL ZNP		EA	30
9	59630901	59630901	E0017	.HINGE		EA	1
10	59621503	59621503	E0017	.TAPPING STRIP		EA	2
11	67121094-26	67121094-26	E0017	.SCREW, HEX SCH CAP - - ATT.PT 5/16-18.X.1.25-STL ZNP		EA	8
12	67122005-09	67122005-09	E0017	.LOCKWASHER, SPLIT - 5/16, - ATT.PT 0.125 W X 0.078 THK - STL ZNP		EA	8
13	67122110-08	67122110-08	E0017	.WASHER, PL - 5/16, 0.688 OD X - ATT.PT 0.065 THK - STL ZNP		EA	8
14	59630426-01	59630426-01	E0017	.ROLLER BRACKET ASSEMBLY, LH - SEE Figure 4-19 FOR DETAIL		EA	1
15	67121043-39	67121043-39	E0017	.SCREW, FLAT REC HD - NO - ATT.PT 6-32 X 0.62 - STL ZNP		EA	20
16	59630904-01	59630904-01	E0017	.PANEL CAP		EA	1
17	59630908	59630908	E0017	.BIPARTING SEAL		EA	1
18	59631510	59631510	E0017	.PLUG, BIPARTING SEAL		EA	1
19	59510929	59510929	E0017	.DOOR FRAME CAP		EA	1
20	67121083-15	67121083-15	E0017	.SCREW, PAN HD REC - NO - ATT.PT 8-32 X 0.75 - STL ZNP		EA	2
21				DELETED			
22	57310510-03	57310510-03	E0017	.RECESSED BUMPER		EA	2
23				DELETED			

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Door Panel Assy, Low Floor, LH (Fig. 4-32)

Section Figure Item	P/N	OEM P/N	OEM Code	Description	MBTA Code	U/M	Qty per Assy
04-032- 24	59620902	59620902	E0017	.EDGE RETAINER		EA	1
25	58336512-06	58336512-06	E0017	.SENSITIVE EDGE ASSEMBLY		EA	1
26	59631509-01	59631509-01	E0017	.PLUG, SENSITIVE EDGE		EA	1
27	59631485-01	59631485-01	E0017	.GUIDE BRACKET		EA	1
28				DELETED			
29				DELETED			
30				DELETED			
31	59620910	59620910	E0017	.KICK PLATE, RH		EA	1
32	59631508-01	59631508-01	E0017	.BOTTOM SEAL		EA	1
33	59621523-01	59621523-01	E0017	.TAPPING PAD		EA	1
34	67121044-05	67121044-05	E0017	.SCREW, FLAT REC HD - NO - ATT.PT 8-32 X 0,62 - STL ZNP		EA	10
35	67121044-07	67121044-07	E0017	.SCREW, FLAT REC HD - NO - ATT.PT 8-32 X 0.88 - STL ZNP		EA	7
36	59630907	59630907	E0017	.WINDOW SEAL, UPPER OUTSIDE		EA	2
37	59630906	59630906	E0017	.WINDOW GLASS, UPPER		EA	2
38	59631506	59631506	E0017	.WINDOW SEAL, UPPER INSIDE		EA	2
39	59630907-01	59630907-01	E0017	.WINDOW SEAL, LOWER OUTSIDE		EA	2
40	59630906-01	59630906-01	E0017	.WINDOW GLASS, LOWER		EA	2
41	59631506-01	59631506-01	E0017	.WINDOW SEAL, LOWER INSIDE		EA	2
42	59640899-01	59640899-01	E0017	.DOOR PANEL, LH, W/RIVETS, CENTER		EA	1
43	59630903	59630903	E0017	.PANEL CAP		EA	1
44				DELETED			
45	67121091-13	67121091-13	E0017	.SCREW, FLAT REC HD - NO - ATT.PT 8-32 X 0.50 - STL ZNP		EA	
46				DELETED			
47				DELETED			
48				DELETED			
49	57410248	57410248	E0017	.CONNECTING FITTING, NYLON		EA	2
50	57410247-06	57410247-06	E0017	.TUBING			AR
51	59630425	59630425	E0017	.STUB SHAFT AND BRACKET ASSEMBLY		EA	1
52	67111045-09	67111045-09	E0017	.SCREW, FLAT HD - 5/16-18 X - ATT.PT 1.00 - STL ZNP		EA	7
53	59630908-01	59630908-01	E0017	.BIPARTING SEAL		EA	1
54	59631510-01	59631510-01	E0017	.PLUG, BIPARTING SEAL		EA	1
55	59510929-01	59510929-01	E0017	.DOOR FRAME CAP		EA	1
56	59620909-01	59620909-01	E0017	.KICK PLATE, LH		EA	1
57				DELETED			

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Door Panel Assy, Low Floor, LH (Fig. 4-32)

Section Figure Item	P/N	OEM P/N	OEM Code	Description	MBTA Code	U/M	Qty per Assy
04-032- 58				DELETED			
59	59631507-01	59631507-01	E0017	.BOTTOM SEAL		EA	1
60	59621523	59621523	E0017	TAPPING PAD		EA	1
61	59630424	59630424	E0017	.PIVOT BRACKET		EA	1
62				DELETED			
63				DELETED			
64				DELETED			
65				DELETED			
66				DELETED			
67				DELETED			
68				DELETED			
69	59640898-01	59640898-01	E0017	.DOOR PANEL, LH, W/RIVETS, HINGED		EA	1
70	97521940-89	97521940-89	E0017	.LABEL, IDENTIFICATION		EA	1

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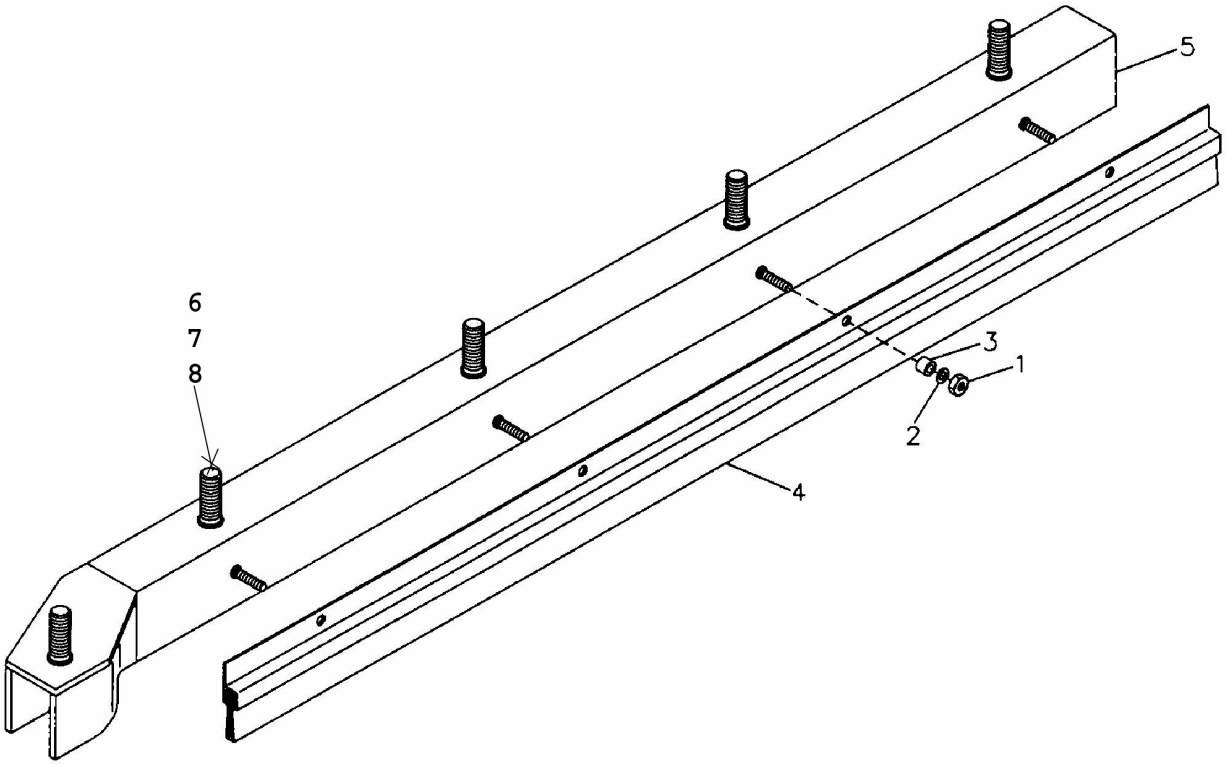

Figure 4-33 Roller Channel Assembly, RH, Center Door

Roller Channel Assembly, RH, Center Door (Fig. 4-33)

Section Figure Item	P/N	OEM P/N	OEM Code	Description	MBTA Code	U/M	Qty per Assy
04-033-	59631337	59631337	E0017	ROLLER CHANNEL ASSEMBLY, RH, CENTER DOOR - SEE Figure 4-26 FOR NHA		EA	1
A	59631337-01	59631337-01	E0017	ROLLER CHANNEL ASSEMBLY, LH, CENTER DOOR - SEE Figure 4-26 FOR NHA		EA	1
1	67113015-02	67113015-02	E0017	.NUT, HEX KEPS - NO 8-32 - ATT.PT		EA	4
2	67122110-05	67122110-05	E0017	.WASHER, PL - NO 8, 0.375 OD - ATT.PT X 0.032 THK - STL ZNP		EA	4
3	57411176-04	57411176-04	E0017	.SPACER		EA	4
4	58820383-03	58820383-03	E0017	.BRUSH SEAL ASSEMBLY		EA	1
5	59631003	59631003	E0017	.CHANNEL ASSEMBLY, RH		EA	1
5A	59631003-01	59631003-01	E0017	.CHANNEL ASSEMBLY, LH		EA	1
6	McMaster-Carr 91831A030			LOCK NUT, 5/16-18 Ny-Lok, s/stl ph 18-18		EA	10
7	McMaster-Carr 98370A017			FLAT WASHER, 5/16, s/stl ph 18-18		EA	10
8	McMaster-Carr 91007A632			LOCK WASHER, 5/16, s/stl ph 18-18		EA	10

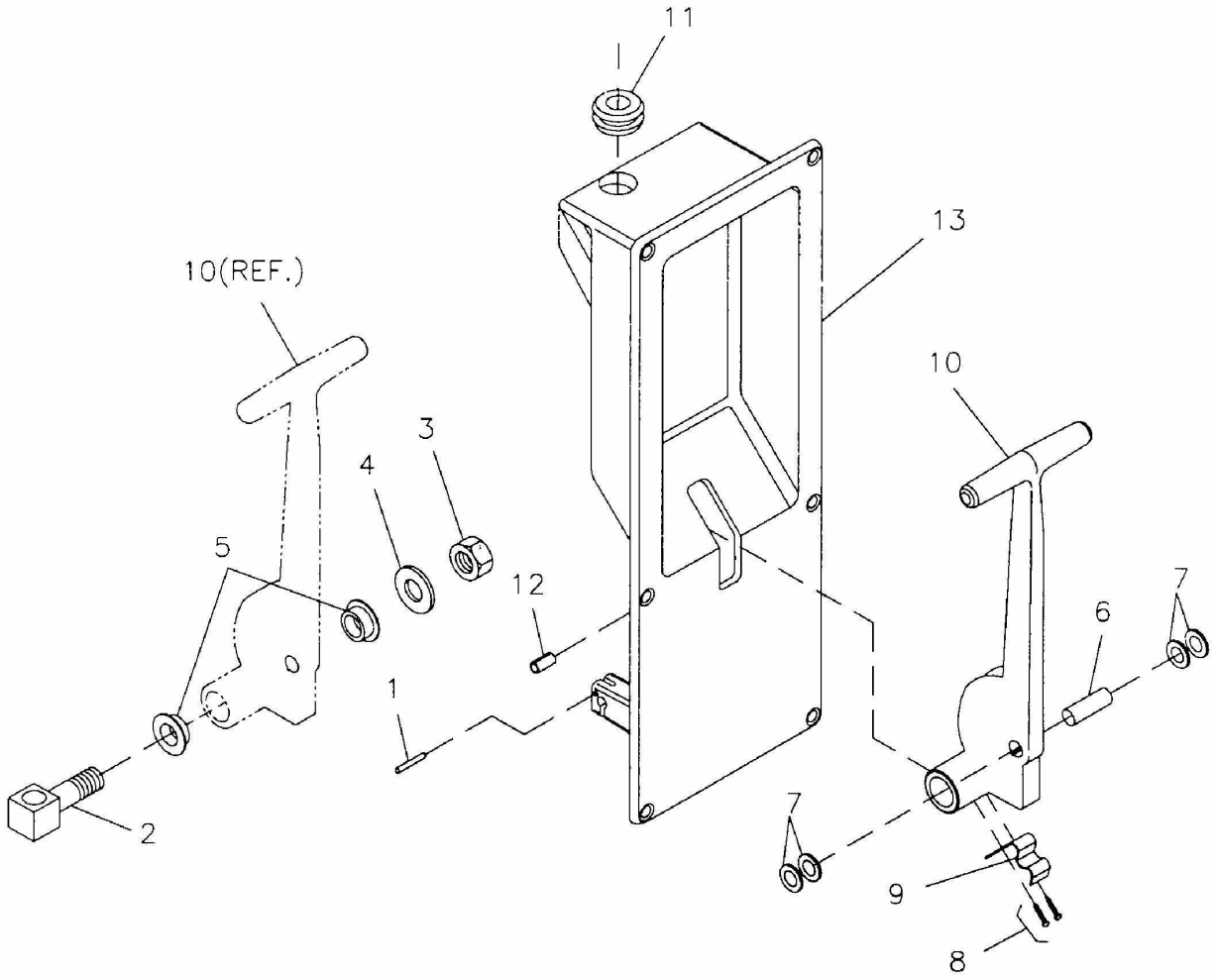

Figure 4-34 Manual Release Assy

Manual Release Assy (Fig. 4-34)

Section Figure Item	OEM P/N	P/N	OEM Code	Description	MBTA Code	U/M	Qty per Assy
04-034-	59660981	R12354210	E0017	MANUAL RELEASE ASSY - SEE Figure 4-1 FOR NHA - 2-62, 2-63, 2-64 FOR INSTALLATION		EA	1
1	67124002-01	67124002-01	E0017	.PIN, ROLL - 0.062 X 0.056 LG - ATT.PT		EA	1
2	59611173	59611173	E0017	.CABLE MOUNT PIN		EA	1
3	56710106-10	56710106-10	E0017	.NUT, LOCKING - 1/2-20 - STL - ATT.PT ZNP		EA	1
4	67122110-11	67122110-11	E0017	.WASHER, PL- 1/2, 1.062 ODX -ATT.PT 0.095 THK - STL ZNP		EA	1
5	57110105-03	57110105-03	E0017	.FLANGED BEARING		EA	2
6	18420376-09	18420376-09	E0017	.DOWEL PIN-0.375 x 1.125 LG -ATT.PT		EA	1
7	16910177-05	16910177-05	E0017	.WASHER, INSULATING		EA	4
8	67121038	67121038	E0017	.SCREW, BUTTON HD - NO 6-32 - ATT.PT X 0.0250 - STL ZNP		EA	2
9	57211047	57211047	E0017	.SPRING, EMERGENCY LEVER		EA	1
10	59631120	59631120	E0017	.MANUAL RELEASE HANDLE		EA	1
11	56216366-06	56216366-06	E0017	.BUSHING		EA	1
12	67124004-05	67124004-05	E0017	.PIN, ROLL - 0.250 X 1.38 LG - ATT.PT		EA	1
13	59661453	59661453	E0017	.MACHINED HOUSING		EA	1

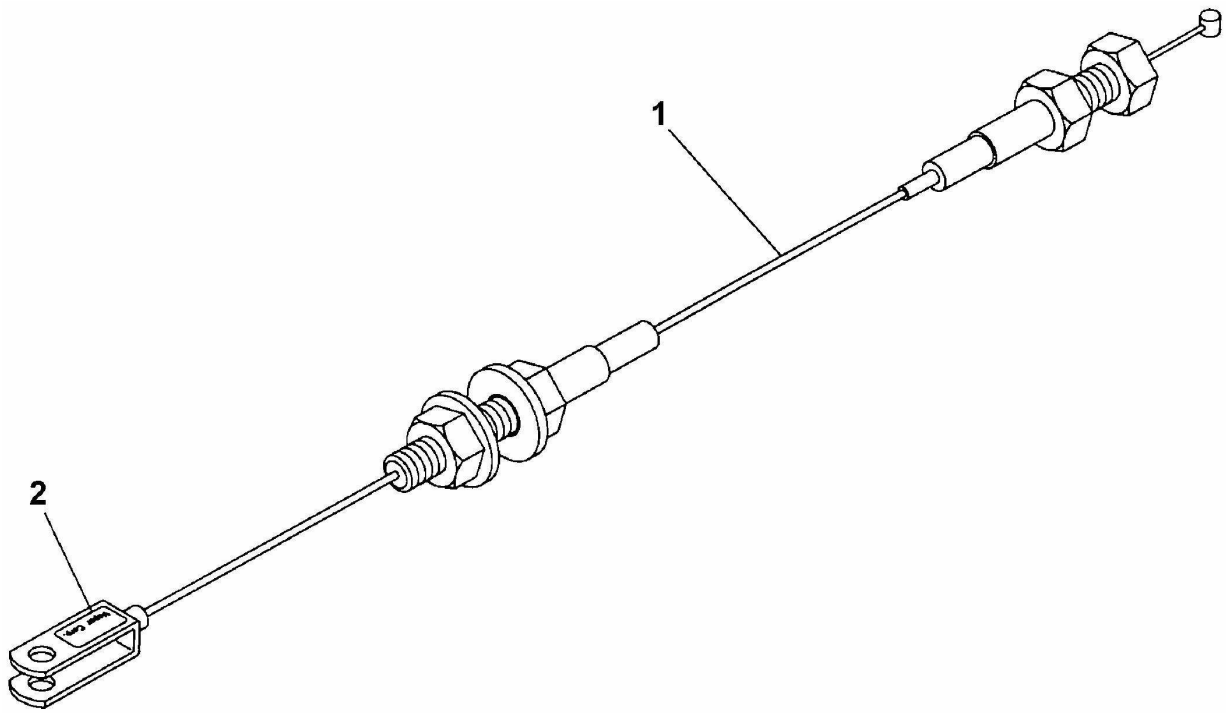

Figure 4-35 Cable Assy, Manual Release

Cable Assy, Manual Release (Fig. 4-35)

Section Figure Item	OEM P/N	P/N	OEM Code	Description	MBTA Code	U/M	Qty per Assy
04-035-	59630958	59630958	E0017	CABLE ASSY, MANUAL RELEASE - SEE Figure 4-1 FOR NHA		EA	1
1	59630958-99	59630958-99	E0017	.CABLE ASSEMBLY		EA	1
2	97521921-72	97521921-72	E0017	.LABEL, IDENTIFICATION		EA	1

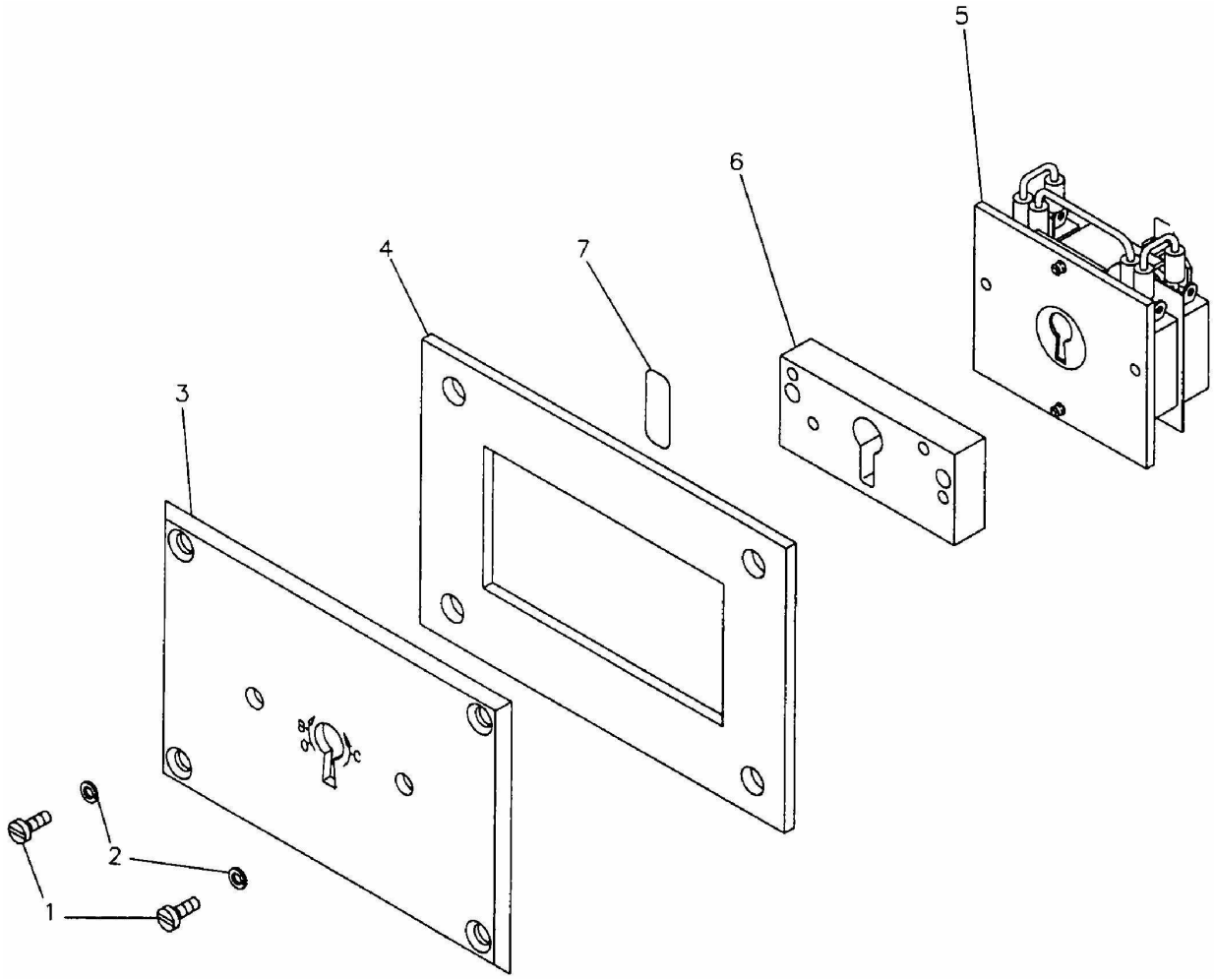

Figure 4-36 Crew Key Switch Assy, Inside

Crew Key Switch Assy, Inside (Fig. 4-36)

Section Figure Item	OEM P/N	P/N	OEM Code	Description	MBTA Code	U/M	Qty per Assy
04-036-	59641346	R12354220	E0017	CREW KEY SWITCH ASSY, INSIDE - SEE Figure 4-1 FOR NHA - 2-62, 2-63, 2-64 FOR INSTALLATION		EA	1
1	67121083-18	67121083-18	E0017	.SCREW, PAN HD REC - NO - ATT.PT 6-32 X 5/8		EA	2
2	67122002-02	67122002-02	E0017	.LOCKWASHER, CTSK - NO 6 - - ATT.PT STL ZNP		EA	2
3	59720560	59720560	E0017	.COVER PLATE		EA	1
4	57410866	57410866	E0017	.GASKET, MOUNTING PLATE		EA	1
5	59740557	59740557	E0017	.CREW KEY SWITCH ASSEMBLY		EA	1
6	57110524-04	57110524-04	E0017	.SPACER		EA	1
7	97521943-06	97521943-06	E0017	.LABEL, IDENTIFICATION		EA	1

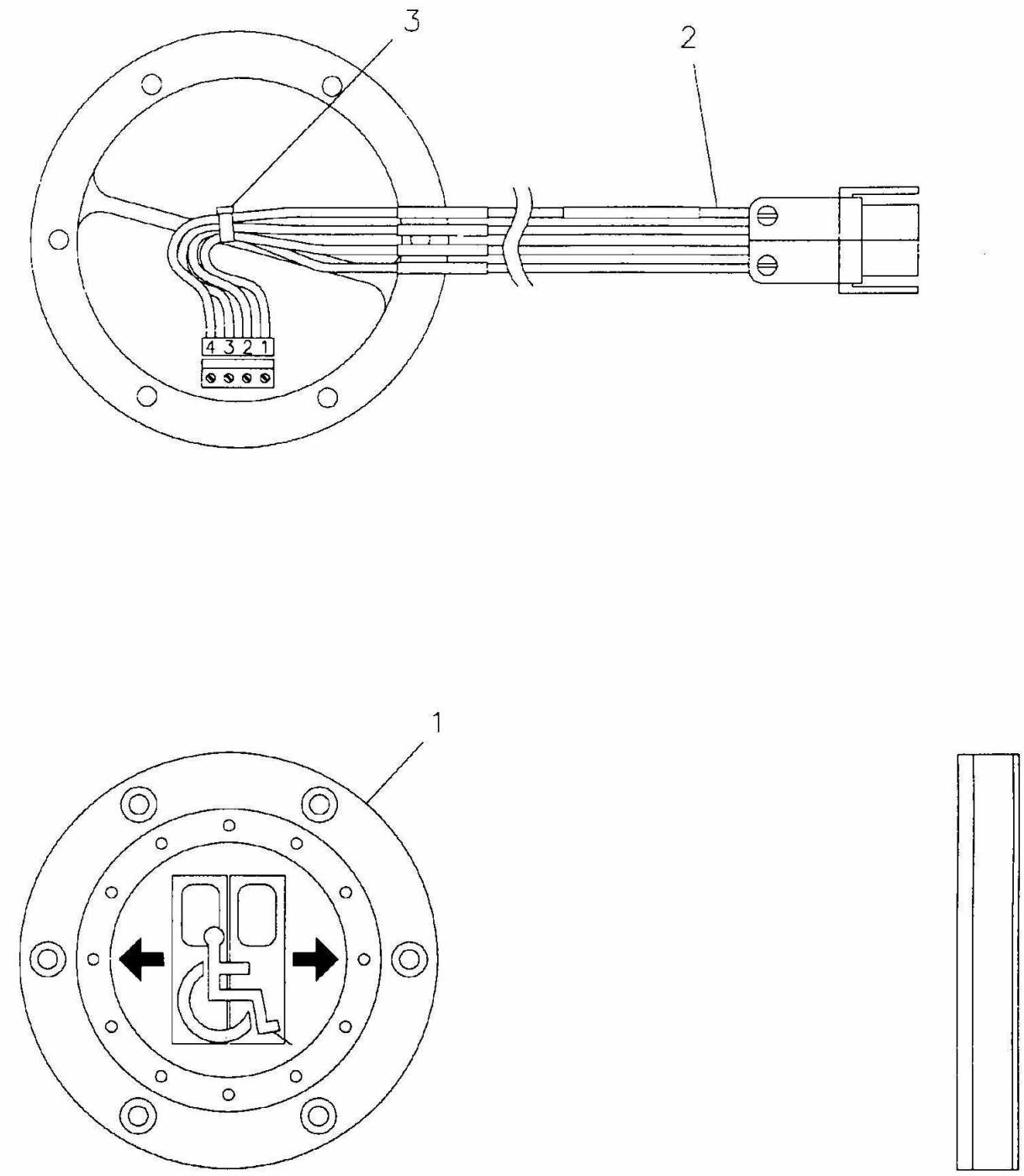

Figure 4-37 Pushbutton, Bridgeplate Request

Pushbutton, Bridgeplate Request (Fig. 4-37)

Section Figure Item	OEM P/N	P/N	OEM Code	Description	MBTA Code	U/M	Qty Per Assy
04-037-	59631343	R12354222	E0017	PUSHBUTTON, BRIDGEPLATE REQUEST - SEE Figure 4-1 FOR NHA - 2-13, 2-16, 2-20, 2-63, 2-64, 2-88 FOR INSTALLATION		EA	1
1	59420026-03	59420026-03	E0017	.PASSENGER PUSHBUTTON		EA	1
2	59621434	59621434	E0017	.CABLE ASSEMBLY		EA	1
3	56216476-06	56216476-06	E0017	.HARNESS TIE		EA	1

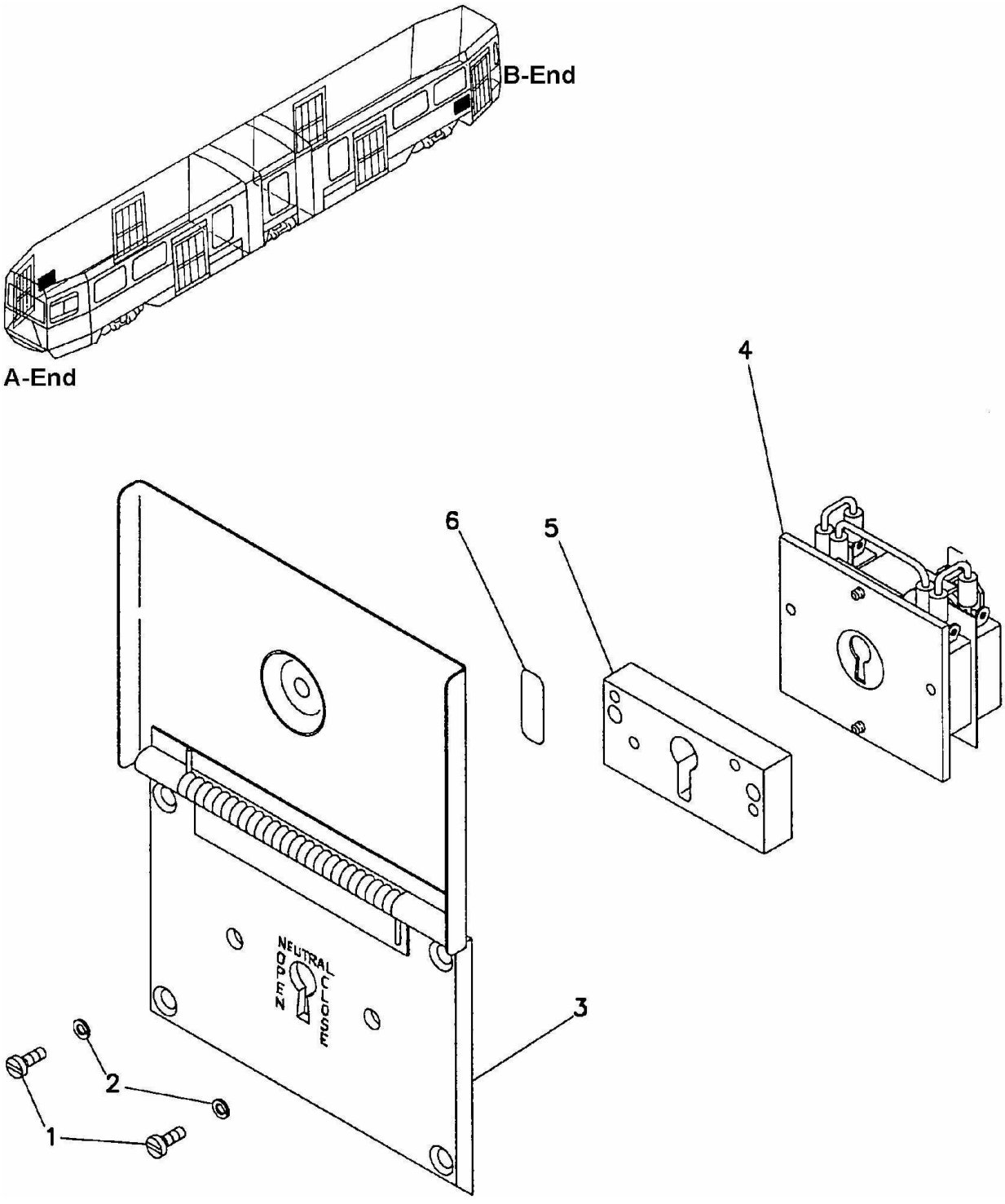

Figure 4-38 Crew Key Switch Assy, End Door, Outside

Crew Key Switch Assy, End Door, Outside (Fig. 4-38)

Section Figure Item	OEM P/N	P/N	OEM Code	Description	MBTA Code	U/M	Qty per Assy
04-038-	59446698	R12354120	E0017	CREW KEY SWITCH ASSY, END DOOR, OUTSIDE - SEE FIG. 2-17 FOR INSTALLATION		EA	1
1	67121083-18	67121083-18	E0017	.SCREW, PAN HD REC - NO - ATT.PT 6-32 X 5/8		EA	2
2	97010060-02	97010060-02	E0017	.FASTENER SEAL		EA	2
3	59720558	59720558	E0017	.COVER AND PLATE ASSEMBLY (Includes Gasket)		EA	1
4	59740556	59740556	E0017	.CREW KEY SWITCH ASSEMBLY		EA	1
5	57110524-03	57110524-03	E0017	.SPACER		EA	2
6	97521943-04	97521943-04	E0017	.LABEL, IDENTIFICATION		EA	1

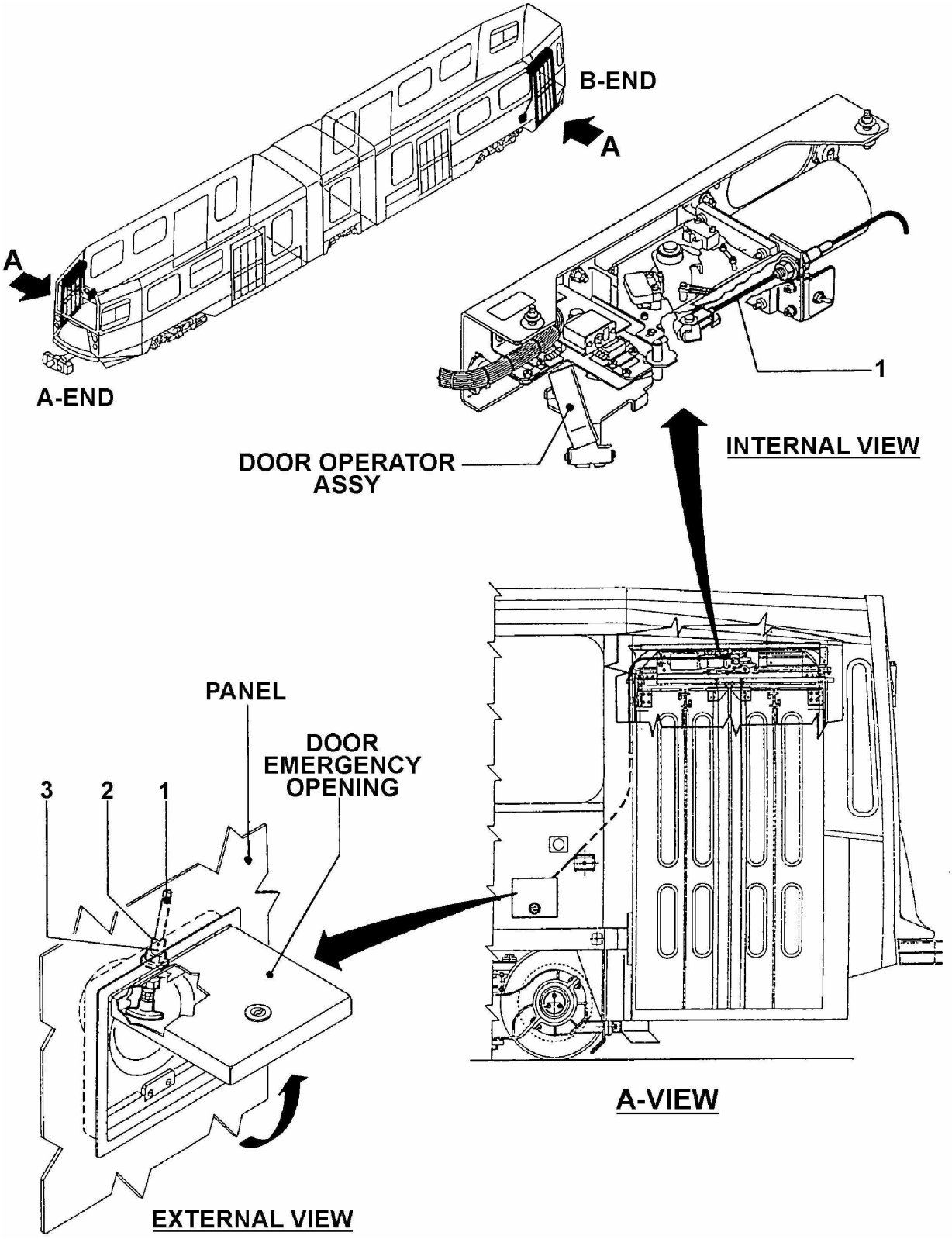

Figure 4-39 Cable Instl, End Door Release

Cable Instl, End Door Release (Fig. 4-39)

Section Figure Item	P/N	OEM P/N	OEM Code	Description	MBTA Code	U/M	Qty per Assy
04-039-	R12354124	R12354124	A0185	CABLE INSTL, END DOOR RELEASE - SEE Figure 4-1 FOR NHA		EA	1
1	R12354125	59436697	E0017	.CABLE ASSEMBLY		EA	1
2	R12354126	R12354126	A0185	.BUSHING (TO USE WHEN PIPE DIA IS 0.7x0.06)		EA	1
3	R123541241	NO 8-32 UNCx3/16-SS	Z9009	.SCREW, SET, SOCKET HD - - ATT.PT NO 8 -UNC x 3/16 - SSTL AISI 384		EA	2

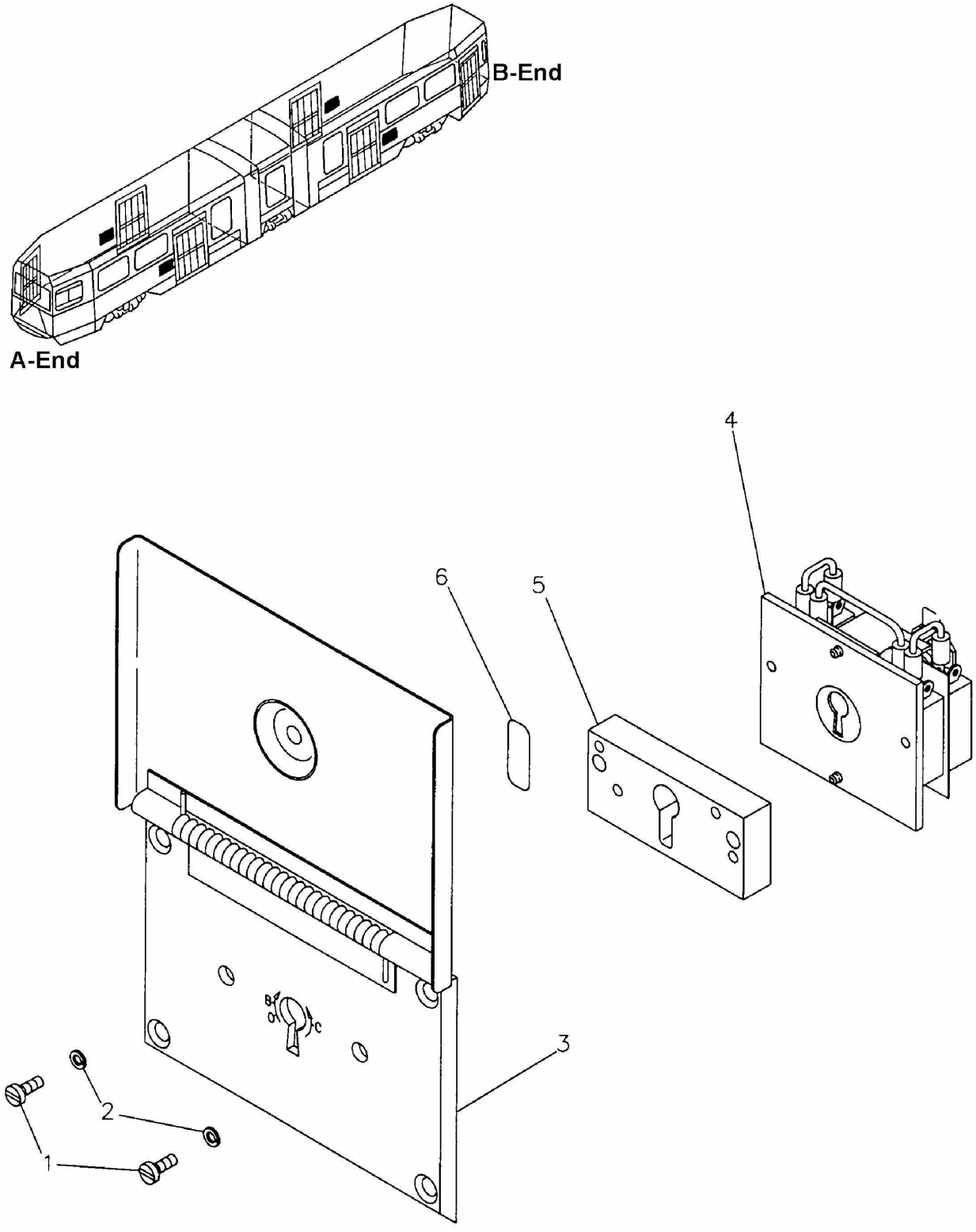

Figure 4-40 Crew Key Switch Assy, Ctr Door, Outside

Crew Key Switch Assy, Ctr Door, Outside (Fig. 4-40)

Section Figure Item	P/N	OEM P/N	OEM Code	Description	MBTA Code	U/M	Qty per Assy
04-040-	R12354221	59641345	E0017	CREW KEY SWITCH ASSY, CTR DOOR, OUTSIDE - SEE Figure 4-1 FOR NHA		EA	1
1	67121083-18	67121083-18	E0017	.SCREW, PAN HD REC - NO - ATT.PT 6-32 X 5/8		EA	2
2	97010060-02	97010060-02	E0017	.FASTENER SEAL		EA	2
3	59720559	59720559	E0017	.COVER AND PLATE ASSEMBLY (Includes Gasket)		EA	1
4	59740557	59740557	E0017	.CREW KEY SWITCH ASSEMBLY		EA	1
5	57110524-04	57110524-04	E0017	.SPACER		EA	2
6	97521943-05	97521943-05	E0017	.LABEL, IDENTIFICATION		EA	1

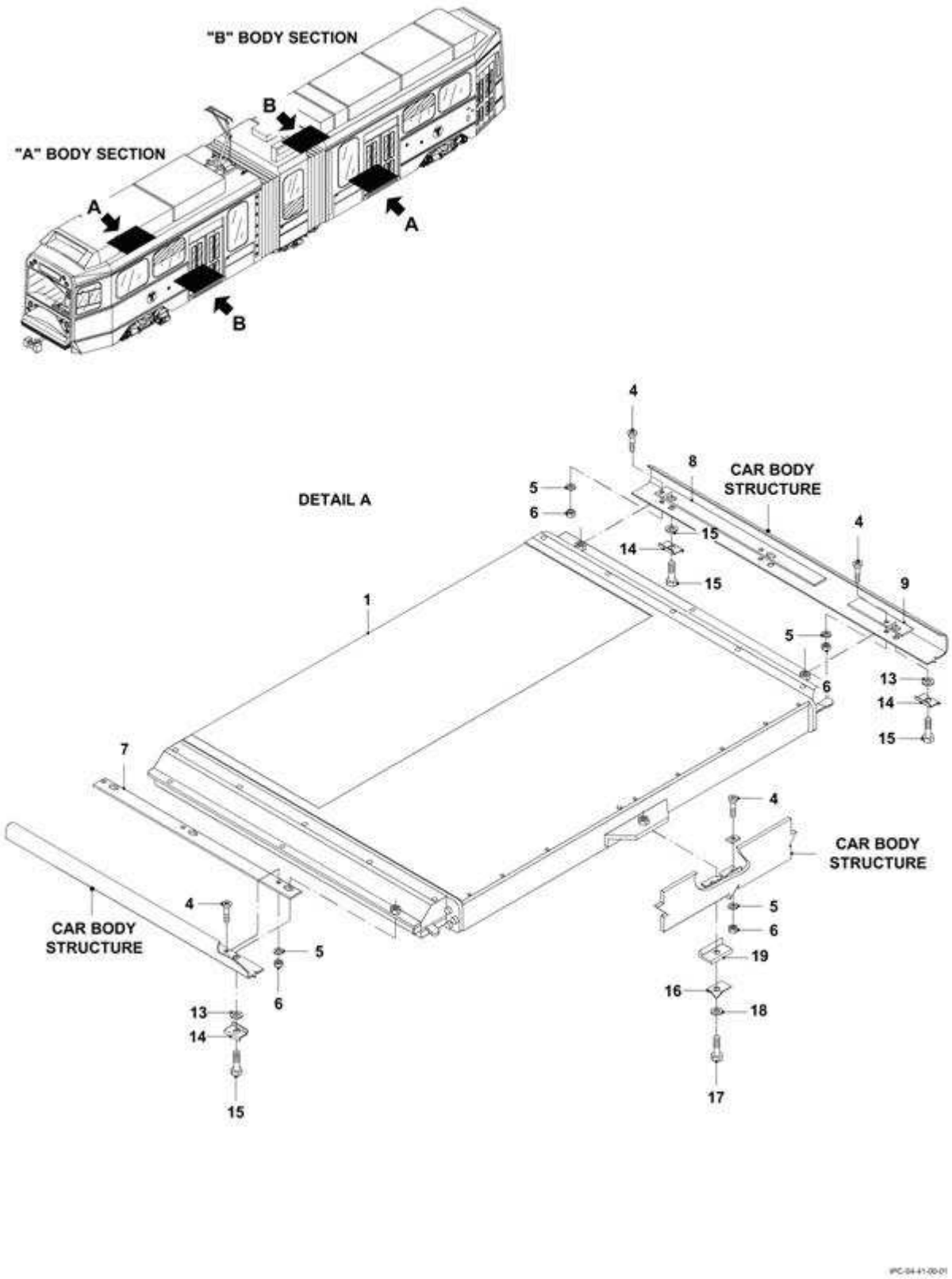

Figure 4-41 Bridgeplates Installation (Sheet 1 of 2)

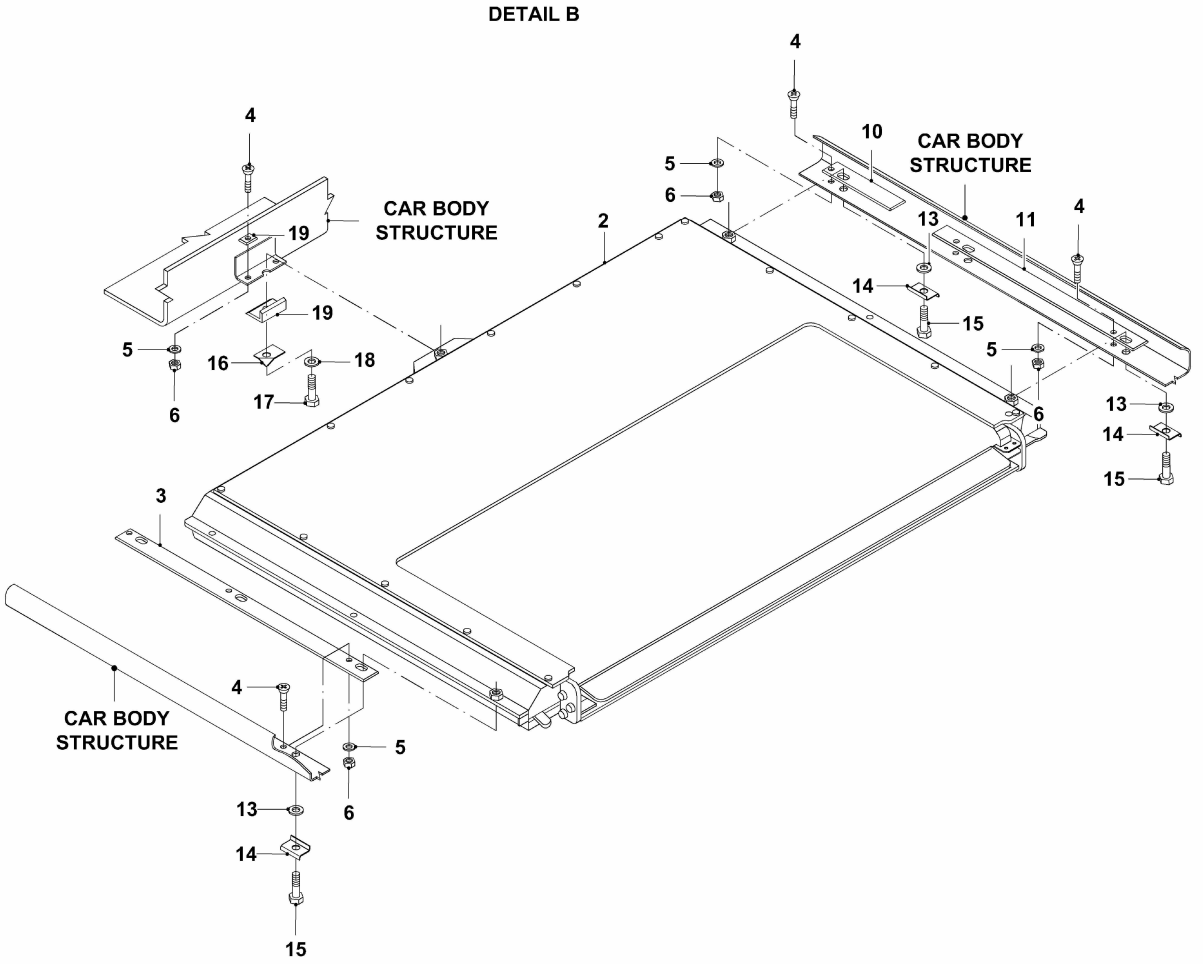

Figure 4-41 Bridgeplates Installation (Sheet 2 of 2)

Bridgeplates Installation (Fig. 4-41)

Section Figure Item	P/N	OEM P/N	OEM Code	Description	MBTA Code	U/M	Qty per Assy
04-041-	R12354050	R12354050	A0185	BRIDGEPLATES INSTALLATION		EA	1
1	R12354700	59566659	E0017	.BRIDGEPLATE ASSY, RH - SEE Figure 4-42 FOR DETAIL		EA	2
2	R12354701	59566659-01	E0017	.BRIDGEPLATE ASSY, LH - SEE Figure 4-42 FOR DETAIL		EA	2
3	R12354063	R12354063	A0185	.SHIM		EA	2
4	R123540503	NO 10-24 UNCx3/4 ANSI B18.3bS	Z9009	.SCREW, HEX SOCKET FLAT CTSK HD - NO 10-24 UNCx3/4 ANSI B18.3 - SSTL AISI 304		EA	36
5	R123540504	NO 10 ST C514-S	Z9009	.WASHER, PLAIN - NO 10 STC 514 - TYPE S STC 514		EA	36
6	R123540505	NO 10 ST C512-S	Z9009	.NUT, SELF-LOCKING - NO 10 STC 512 - TYPES STC 512		EA	36
7	R12354057	R12354057	A0185	.SHIM		EA	2
8	R12354058	R12354058	A0185	.SHIM		EA	2
9	R12354059	R12354059	A0185	.SHIM		EA	2
10	R12354062	R12354062	A0185	.SHIM		EA	2
11	R12354061	R12354061	A0185	.SHIM		EA	2
12	R12354060	R12354060	A0185	.SHIM		EA	8
13	R123540502	1/2 ST C514-S	Z9009	.WASHER, PLAIN -1/2 STC 514 - TYPE S STC 514		EA	24
14	R12354055	R12354055	A0185	.WASHER, LOCK - ATT.PT		EA	24
15	R123540501	3/8x1-1/4 STC 507-S	Z9009	.BOLT, HEX - 3/8x1-1/4 STC 507 - ATT.PT - TYPE S STC 507		EA	24
16	R12354056	R12354056	A0185	.WASHER, LOCK - ATT.PT		EA	4
17	R123540507	3/8x1-1/2 STC 507-S	Z9009	.BOLT, HEX - 3/8x1-1/2 STC 507 - TYPE S STC 507		EA	4
18	R123540506	3/8 A ANSI B27.2 - S	Z9009	.WASHER, PLAIN TYPE A - 3/8 A ANSI B27.2 - SSTL AISI 304		EA	4
19	R12354065	R12354065	A0185	.PLATE		EA	4

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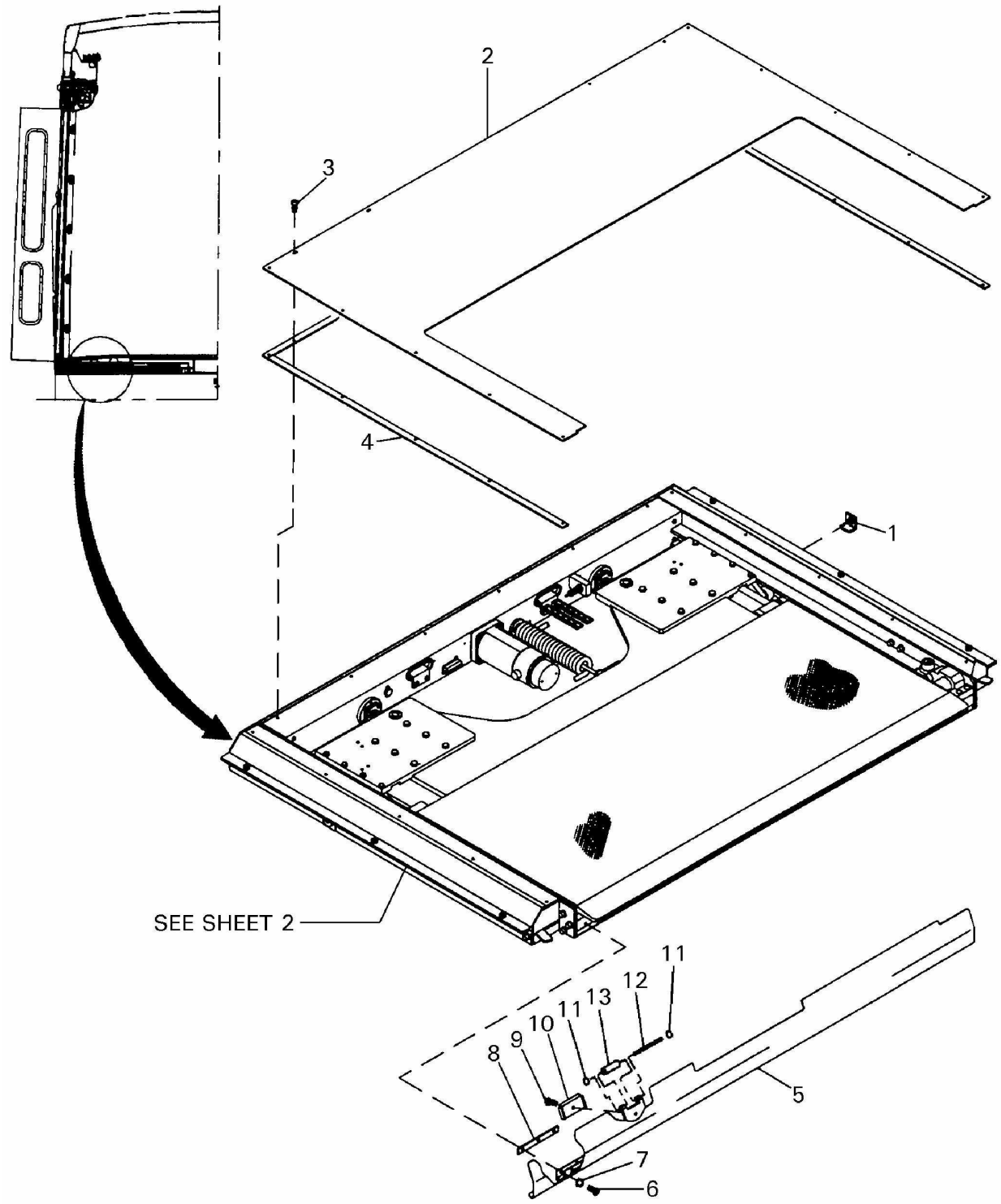

Figure 4-42 Bridgeplate Assy, RH (Sheet 1 of 10)

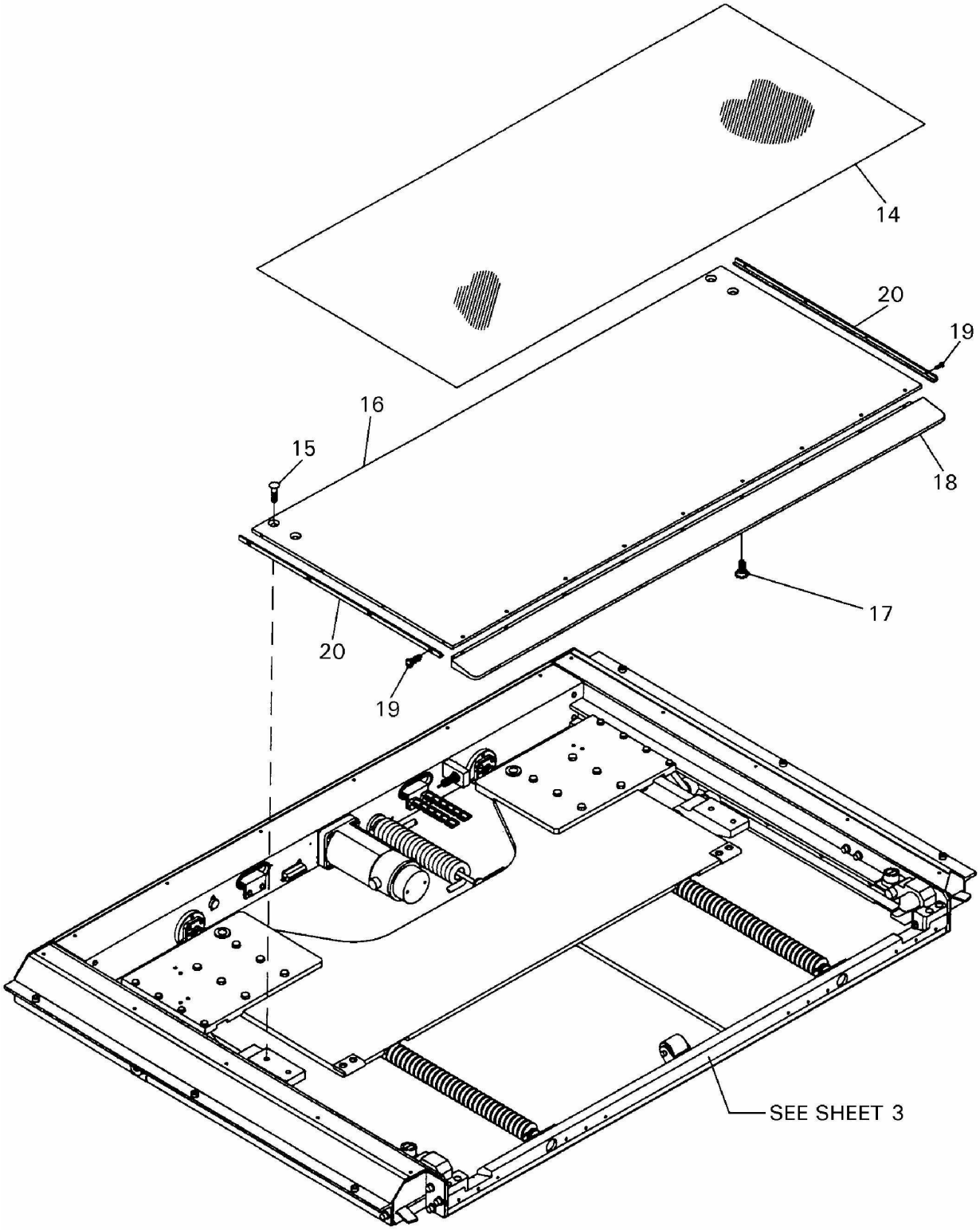

Figure 4-42 Bridgeplate Assy, RH (Sheet 2 of 10)

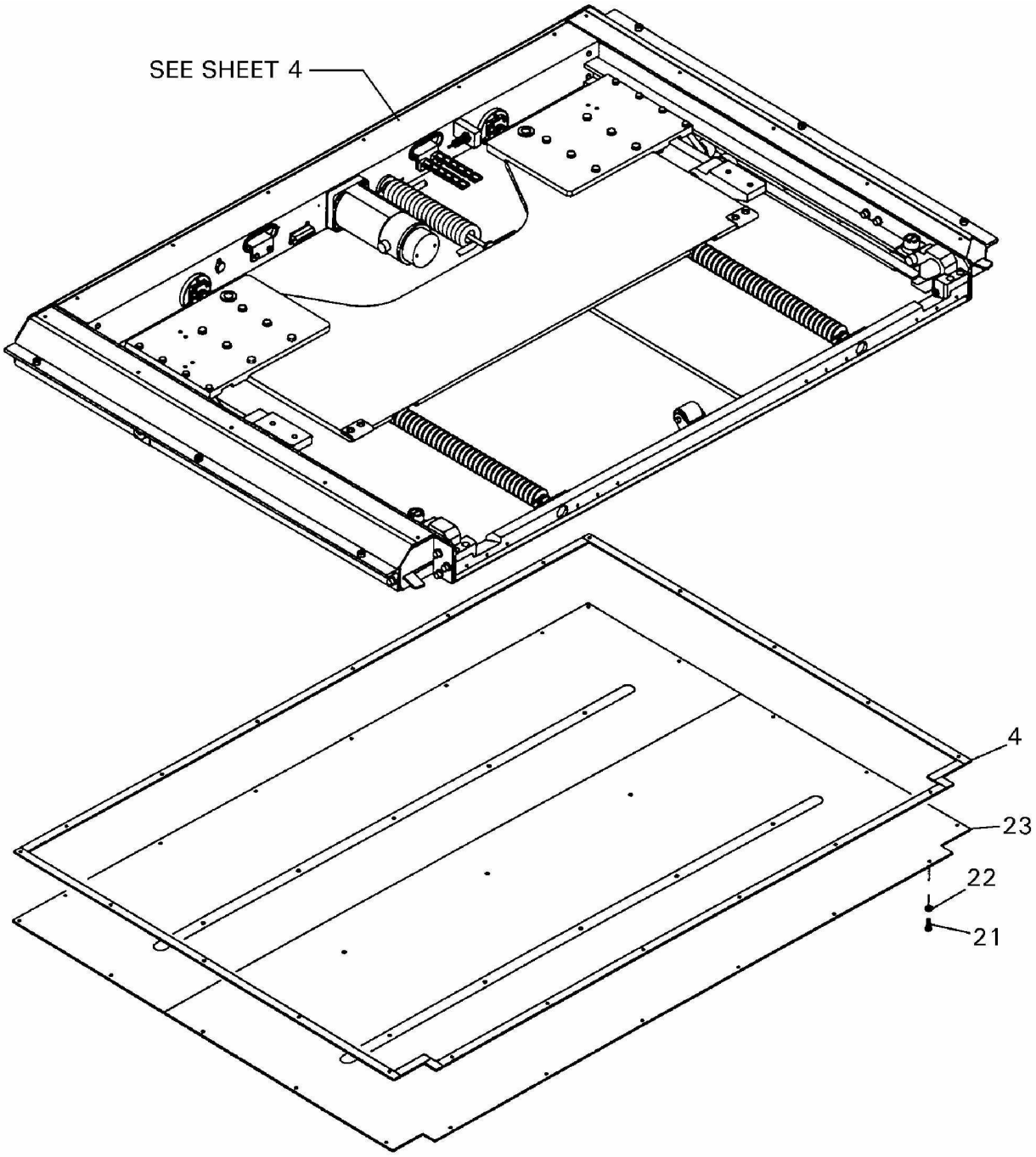

Figure 4-42 Bridgeplate Assy, RH (Sheet 3 of 10)

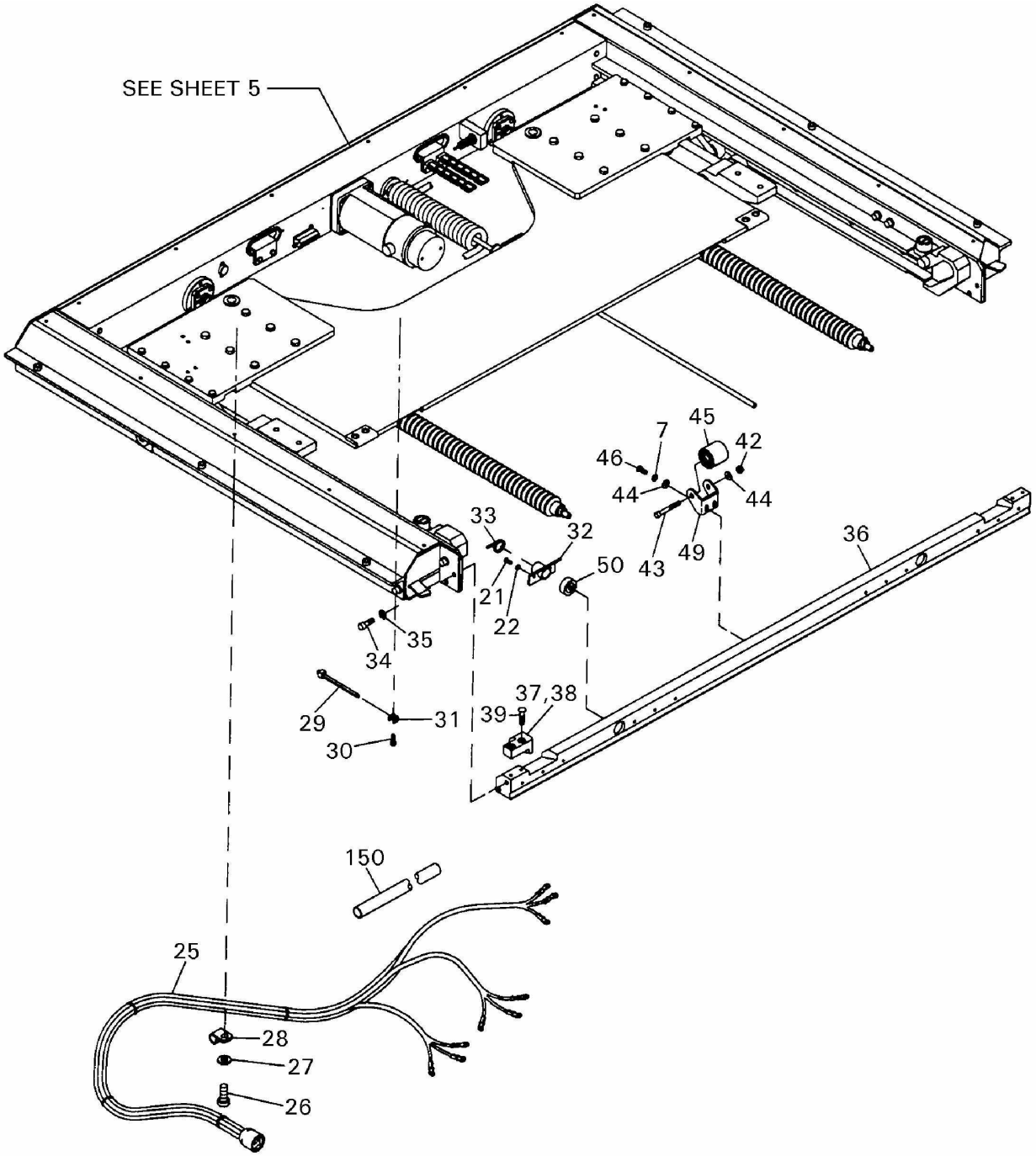

Figure 4-42 Bridgeplate Assy, RH (Sheet 4 of 10)

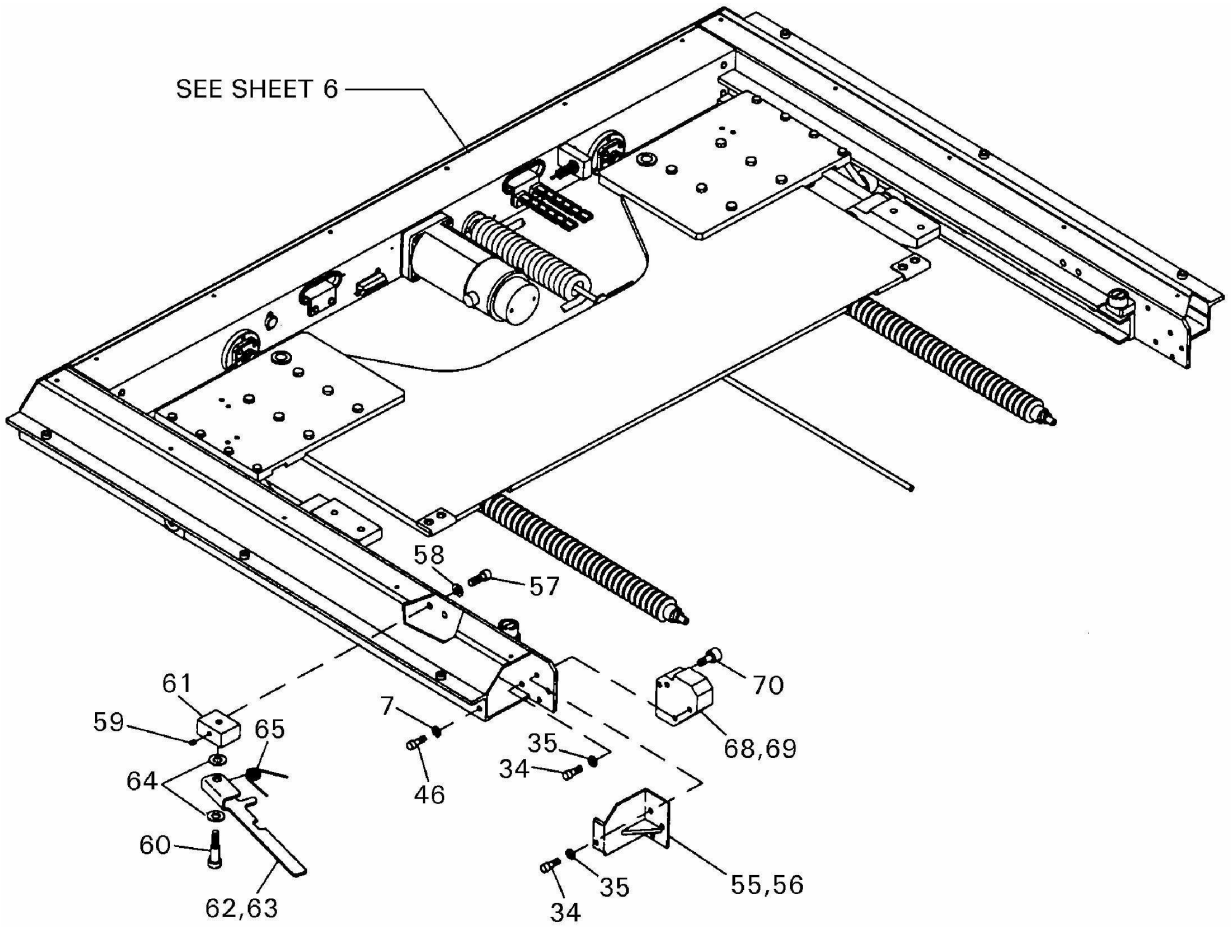

Figure 4-42 Bridgeplate Assy, RH (Sheet 5 of 10)

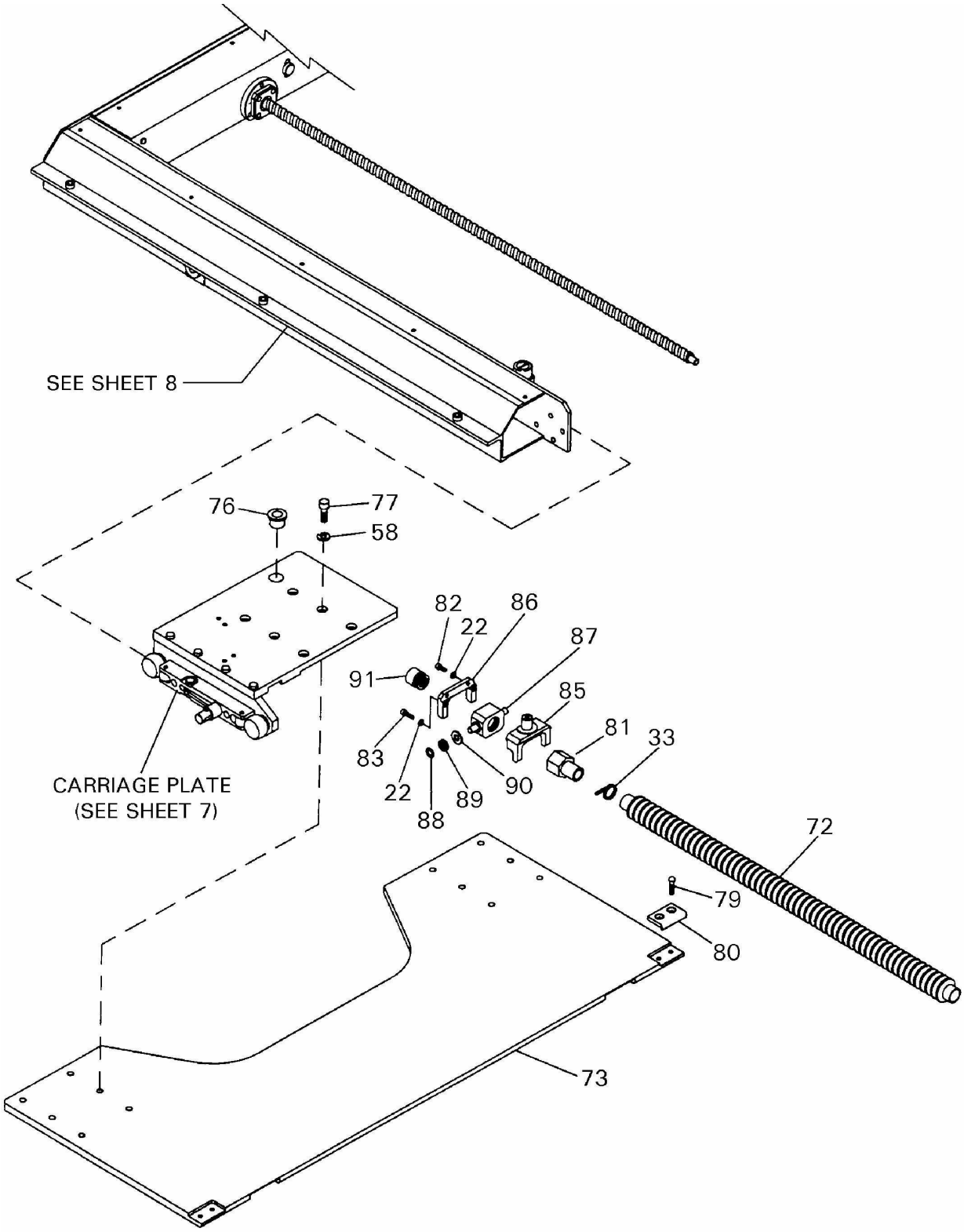

Figure 4-42 Bridgeplate Assy, RH (Sheet 6 of 10)

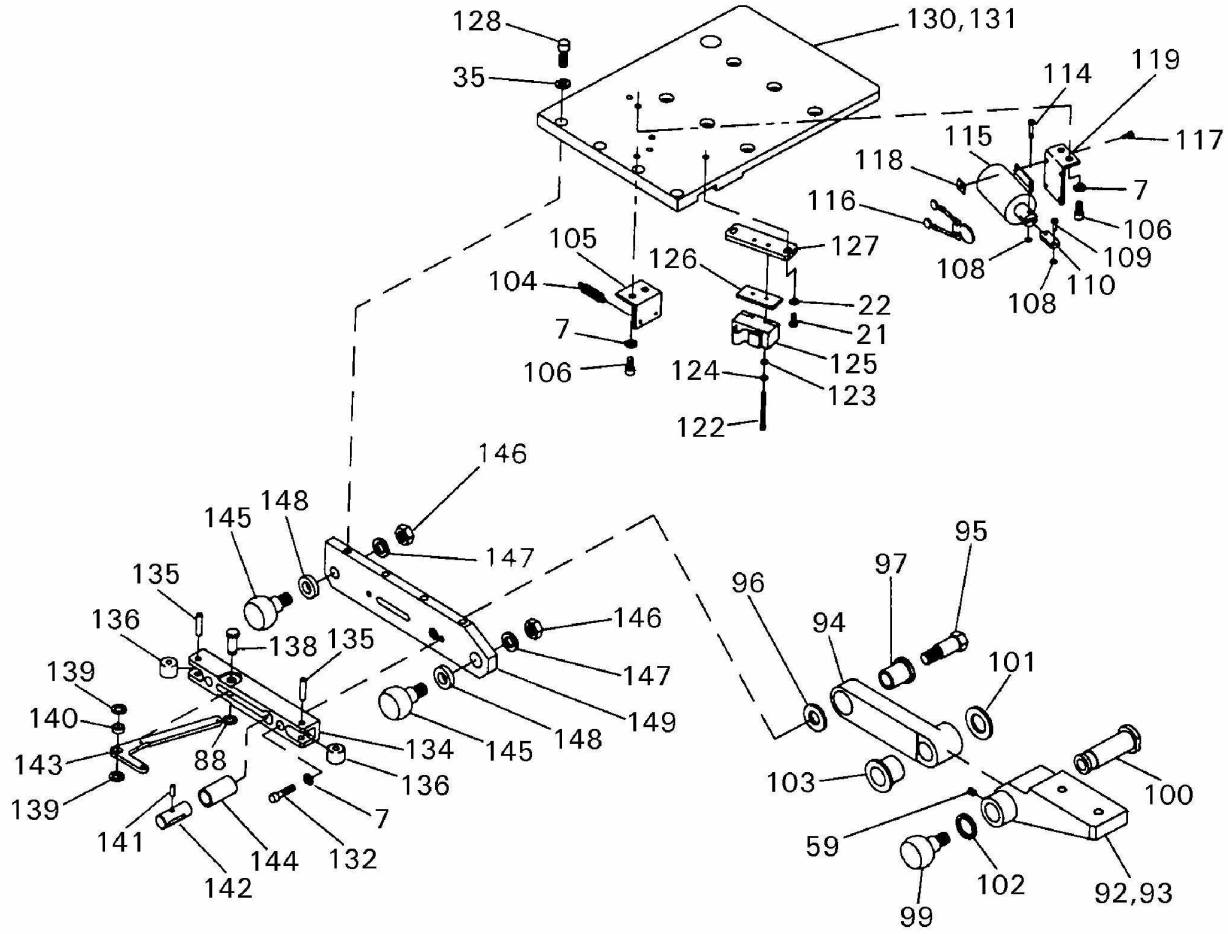

Figure 4-42 Bridgeplate Assy, RH (Sheet 7 of 10)

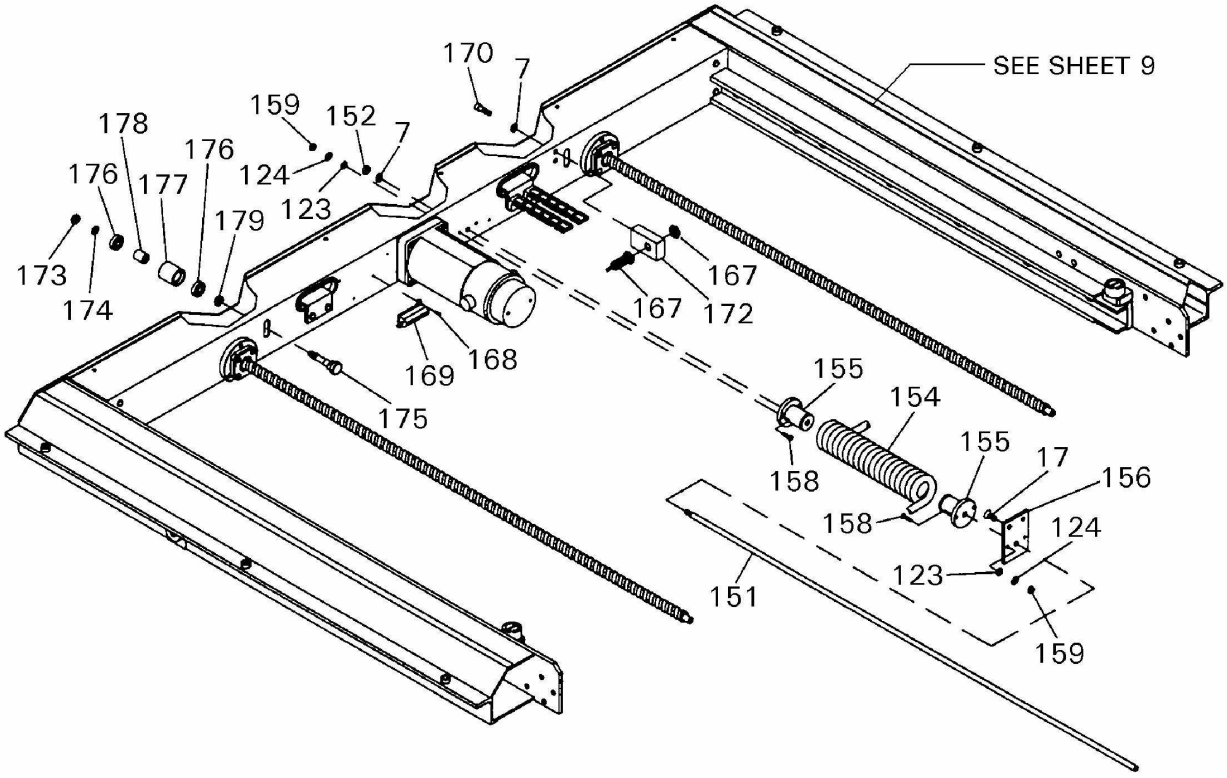

Figure 4-42 Bridgeplate Assy, RH (Sheet 8 of 10)

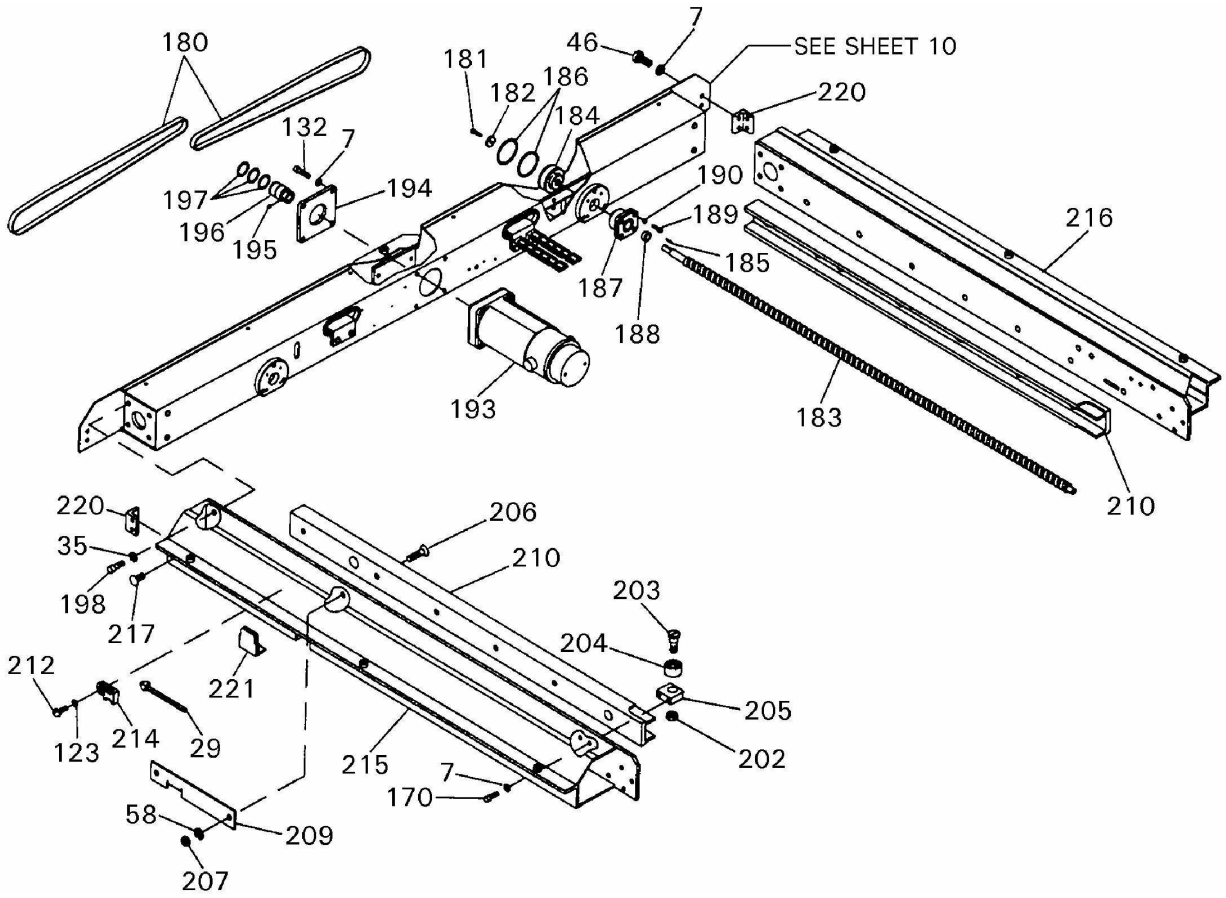

Figure 4-42 Bridgeplate Assy, RH (Sheet 9 of 10)

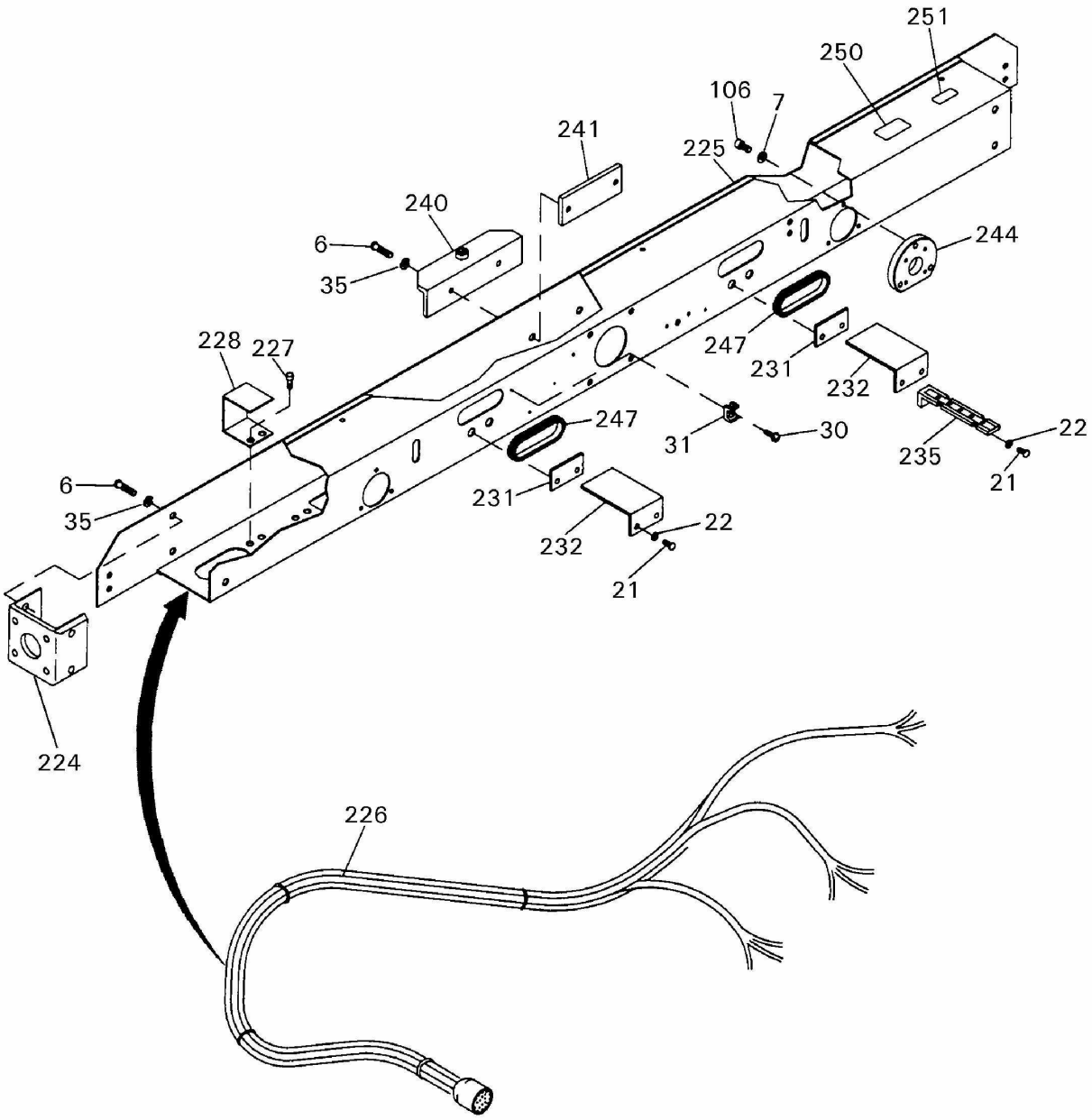

Figure 4-42 Bridgeplate Assy, RH (Sheet 10 of 10)

Bridgeplate Assy, RH (Fig. 4-42)

Section Figure Item	P/N	OEM P/N	OEM Code	Description	MBTA Code	U/M	Qty per Assy
04-042-	R12354700	59566659	E0017	BRIDGEPLATE ASSY, RH - SEE Figure 4-1 FOR NHA		EA	1
A	R12354701	59566659-01	E0017	BRIDGEPLATE ASSY, LH - SEE Figure 4-1 FOR NHA		EA	1
1	59621379	59621379	E0017	.FITTING BRACKET (USED ON RH BRIDGEPLATE)		EA	1
2	59641371	59641371	E0017	.TOP COVER		EA	1
3	59710910	59710910	E0017	.FASTENER, SNAP-IN		EA	16
4	57320629-66	57320629-66	E0017	.GASKET, ADHESIVE BACK 1/16 THK x 3/4 w			AR
5	59641167	59641167	E0017	.FRONT COVER ASSEMBLY		EA	1
6	67121038-45	67121038-45	E0017	.SCREW, BUTTON HD - 5/16-18 - ATT.PT X 0.75 - STL ZNP		EA	20
7	67122005-42	67122005-42	E0017	.LOCKWASHER, SPLIT-1/4, - ATT.PT 0.109 W X 0.062 THK - STL ZNP		EA	49
8	59621160	59621160	E0017	.SPACER		EA	4
9	97620117-97	97620117-97	E0017	.SCREW, TRQ PATCH - ATT.PT		EA	2
10	59621165	59621165	E0017	.COVER GUIDE		EA	2
11	96520020-67	96520020-67	E0017	.RETAINING RING, EXTERNAL - ATT.PT		EA	4
12	59621163	59621163	E0017	.ROLLER SHAFT		EA	2
13	59621164	59621164	E0017	.ROLLER		EA	2
14	59621488	59621488	E0017	TRACTION SURFACE		EA	1
15	97620117-95	97620117-95	E0017	.SCREW, TRQ PATCH - ATT.PT		EA	4
16	59640730	59640730	E0017	.BRIDGEPLATE RAMP		EA	1
17	97620117-98	97620117-98	E0017	.SCREW, TRQ PATCH - ATT.PT		EA	15
18	59640731	59640731	E0017	.PLATE, NOSE		EA	1
19	97620117-86	97620117-86	E0017	.SCREW, TRQ PATCH - ATT.PT		EA	8
20	59641168	59641168	E0017	.ROLLER GUIDE		EA	1
21	67121038-41	67121038-41	E0017	.SCREW, BUTTON HD - NO - ATT.PT 10-32X0.050-STL ZNP		EA	24
22	67122005-40	67122005-40	E0017	.LOCKWASHER, SPLIT - NO 10, - ATT.PT 0.062 W x 0.047 THK - STL ZNP		EA	32
23	59641372	59641372	E0017	.BOTTOM COVER ASSEMBLY		EA	1
24				DELETED			

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Bridgeplate Assy, RH (Fig. 4-42)

Section Figure Item	P/N	OEM P/N	OEM Code	Description	MBTA Code	U/M	Qty per Assy
04-042- 25A	59730133	59730133	E0017	.ENCODER HARNESS, BRIDGEPLATE (USED ON RH BRIDGEPLATE)		EA	1
25B	59730133-01	59730133-01	E0017	.ENCODER HARNESS, BRIDGEPLATE (USED ON LH BRIDGEPLATE) - (N.I.)		EA	1
26	67121005-26	67121005-26	E0017	.SCREW, SEMS, SLTD - NO - ATT.PT 10-32X0.50-STL ZNP		EA	4
27	T.B.D.	T.B.D.	E0017	.WASHER			AR
28	49830640-02	49830640-02	E0017	.CLAMP, TUBING		EA	4
29	56216476-02	56216476-02	E0017	.HARNESS TIE		EA	5
30	67121004-57	67121004-57	E0017	.SCREW, PHD SLTD SEM - NO - ATT.PT 6-32 X 0.38 - STL ZNP		EA	11
31	17511482-02	17511482-02	E0017	.TIE MOUNT		EA	11
32	59621065	59621065	E0017	.BELLOWS BRACKET, FRONT		EA	2
33	56216476-10	56216476-10	E0017	.HARNESS TIE		EA	4
34	67121251-15	67121251-15	E0017	.SCREW, HEX SOCKET HD CAP - ATT.PT -5/16-18X1.00-STL ZNP		EA	10
35	67122005-43	67122005-43	E0017	.LOCKWASHER, SPLIT - 5/16, - ATT.PT 0.125 W X 0.078 THK - STL ZNP		EA	36
36	59640722	59640722	E0017	.FRONT BAR - SEE Figure 4-43 FOR DETAIL		EA	1
37	59620747	59620747	E0017	.GUIDE RAMP, RH		EA	1
38	59620747-01	59620747-01	E0017	.GUIDE RAMP, LH		EA	1
39	97620117-75	97620117-75	E0017	.SCREW, TRQ PATCH - ATT.PT		EA	4
40				DELETED			
41				DELETED			
42	67113041	67113041	E0017	.NUT, SELF-LOCKING -1/4-20 - ATT.PT UNC- STL ZNP		EA	1
43	67121202-22	67121202-22	E0017	.SCREW, SHOULDERED -1/4-20 - ATT.PT X 1.00-STL ZNP		EA	1
44	67122111-07	67122111-07	E0017	.WASHER, PL -1/4, 0.62 OD X - ATT.PT 0.50 THK - STL ZNP		EA	3
45	59621086	59621086	E0017	.ROLLER		EA	1
46	67121038-18	67121038-18	E0017	.SCREW, BUTTON HD -1/4-20 X - ATT.PT 0.625 - STL ZNP		EA	8
47				DELETED			
48				DELETED			
49	59621082	59621082	E0017	.ROLLER BRACKET		EA	1
50	59620768	59620768	E0017	.ROLLER BEARING		EA	2
51				DELETED			

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Bridgeplate Assy, RH (Fig. 4-42)

Section Figure Item	P/N	OEM P/N	OEM Code	Description	MBTA Code	U/M	Qty per Assy
04-042- 52				DELETED			
53				DELETED			
54				DELETED			
55	59631378	59631378	E0017	.TUBE COVER BRACKET, RH		EA	1
56	59631378-01	59631378-01	E0017	.TUBE COVER BRACKET, LH		EA	1
57	67121038-34	67121038-34	E0017	.SCREW, BUTTON HD - 3/8-16 X - ATT.PT 1.00 - STL ZNP		EA	1
58	67122005-44	67122005-44	E0017	.LOCKWASHER, SPLIT - 3/8, - ATT.PT 0.141 W X 0.094 THK - STL ZNP		EA	26
59	67121100-25	67121100-25	E0017	.SCREW, SET -1/4-20 X 0.250 - - ATT.PT STL ZNP		EA	4
60	67121202-06	67121202-06	E0017	.SCREW, SHOULDERED - 3/8-16 - ATT.PT X 1.00-STL ZNP		EA	2
61	59621078	59621078	E0017	.BLOCK		EA	2
62	59621079	59621079	E0017	.LOCK LEVER, RH		EA	1
63	59621079-01	59621079-01	E0017	.LOCK LEVER, LH		EA	1
64	56910436-12	56910436-12	E0017	.WASHER, THRUST		EA	4
65	59621088	59621088	E0017	.SPRING, TORSION		EA	2
66				DELETED			
67				DELETED			
68	59630723	59630723	E0017	.GUIDE BLOCK, FRONT RH		EA	1
69	59630723-01	59630723-01	E0017	.GUIDE BLOCK, FRONT LH		EA	1
70	59621161	59621161	E0017	.BEARING, CAM FOLLOWER		EA	2
71				DELETED			
72	59631090	59631090	E0017	.BELLOWS		EA	2
73	59640729	59640729	E0017	.SUPPORT PLATE		EA	1
74				DELETED			
75				DELETED			
76	59620737	59620737	E0017	.CARRIAGE BUSHING		EA	2
77	67121251-18	67121251-18	E0017	.SCREW, HEX SOCKET HD CAP - ATT.PT - 3/8-16X0.875-STL ZNP		EA	12
78				DELETED			
79				DELETED			
80	59620746	59620746	E0017	.WEAR PAD		EA	2
81	59621068	59621068	E0017	.NUT, HEX		EA	2
82	67121251-16	67121251-16	E0017	.SCREW, HEX SOCKET HD CAP - ATT.PT - NO 10-32 X 0.50 - STL ZNP		EA	4
83	67121251-17	67121251-17	E0017	.SCREW, HEX SOCKET HD CAP - ATT.PT - NO 10-32 X 0.75 - STL ZNP		EA	4
84				DELETED			
85	59620732	59620732	E0017	.YOKE		EA	2
86	59621064	59621064	E0017	.RETAINER, YOKE		EA	2

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Bridgeplate Assy, RH (Fig. 4-42)

Section Figure Item	P/N	OEM P/N	OEM Code	Description	MBTA Code	U/M	Qty per Assy
04-042- 87	59620733	59620733	E0017	.HOUSING, NUT		EA	2
88	96520020-93	96520020-93	E0017	.RETAINING RING, EXTERNAL - ATT.PT		EA	6
89	56810655-07	56810655-07	E0017	.BEARING, NYLON		EA	4
90	16910177-02	16910177-02	E0017	.WASHER, INSULATING		EA	4
91	59620762	59620762	E0017	.BALLNUT		EA	2
92	59630741	59630741	E0017	.CLEVIS BRACKET, RH		EA	1
93	59630741-01	59630741-01	E0017	.CLEVIS BRACKET, LH		EA	1
94	59620743	59620743	E0017	.LINK		EA	2
95	67121202-23	67121202-23	E0017	.SCREW, SHOULDERED - 1/2 - 13 - ATT.PT X 0.75 - STL ZNP		EA	2
96	56910436-13	56910436-13	E0017	.WASHER, THRUST		EA	2
97	59620770	59620770	E0017	.FLANGED BEARING		EA	2
98				DELETED			
99	59620776	59620776	E0017	.BEARING, CAM FOLLOWER		EA	2
100	59620742	59620742	E0017	.LINK PIN		EA	2
101	56910436-08	56910436-08	E0017	.WASHER, THRUST		EA	2
102	67122133-03	67122133-03	E0017	.WASHER, HARDENED		EA	2
103	56010007-65	56010007-65	E0017	.FLANGED BEARING		EA	2
104	59621087	59621087	E0017	.EXTENSION SPRING		EA	2
105	59621072-01	59621072-01	E0017	.SPRING BRACKET		EA	2
106	67121066-35	67121066-35	E0017	.SCREW, HEX SOCKET HD CAP - ATT.PT – 1/4 - 20 X 0.50 – STL CAD PL		EA	14
107				DELETED			
108	96520020-97	96520020-97	E0017	.RETAINING RING, EXTERNAL - ATT.PT		EA	4
109	59611076	59611076	E0017	.LINK PIN		EA	2
110	59621073-01	59621073-01	E0017	.LINK PLATE		EA	2
111				DELETED			
112				DELETED			
113				DELETED			
114	59611075	59611075	E0017	.SOLENOID PIN		EA	2
115	59621089-01	59621089-01	E0017	.SOLENOID ASSEMBLY		EA	2
116	59810787	59810787	E0017	.VARISTOR ASSEMBLY		EA	1
117	67121038-07	67121038-07	E0017	.SCREW, BUTTON HD - NO 6-32 - ATT.PT X 0.375 - SSTL		EA	8
118	56910175-21	56910175-21	E0017	TAPPING PAD		EA	4
119	59621071	59621071	E0017	.SOLENOID BRACKET		EA	2
120				DELETED			
121				DELETED			
122	67121251-28	67121251-28	E0017	.SCREW, HEX SOCKET HD CAP - ATT.PT - NO 6-32 X 1.25 - STL ZNP		EA	4

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Bridgeplate Assy, RH (Fig. 4-42)

Section Figure Item	P/N	OEM P/N	OEM Code	Description	MBTA Code	U/M	Qty per Assy
04-042- 123	67122111-04	67122111-04	E0017	.WASHER, PL - NO 6, 0.31 OD X - ATT.PT 0.037 THK - SSTL (AUSTENITIC)		EA	9
124	67122005-38	67122005-38	E0017	.LOCKWASHER, SPLIT - NO 6, - ATT.PT 0.47 W X 0.031 THK - SSTL (AUSTENITIC)		EA	8
125	58510962	58510962	E0017	.LEVER SWITCH		EA	2
126	5681059-03	5681059-03	E0017	.SWITCH INSULATOR		EA	2
127	59820814	59820814	E0017	.LIMIT SWITCH BRACKET		EA	2
128	67121066-69	67121066-69	E0017	.SCREW, HEX SOCKET HD CAP - ATT.PT - 5/16 - 18 X 0.88 – SSTL		EA	8
129				DELETED			
130	59640727	59640727	E0017	.CARRIAGE PLATE, RH		EA	1
131	59640727-01	59640727-01	E0017	.CARRIAGE PLATE, LH		EA	1
132	67121066-04	67121066-04	E0017	.SCREW, HEX SOCKET HD CAP - ATT.PT – 1/4 - 20 X 1.00- STL ZNP		EA	8
133				DELETED			
134	59620744	59620744	E0017	.GUIDE BAR		EA	4
135	18420376	18420376	E0017	.DOWEL PIN - 0.25 x 1.00 LG - ATT.PT		EA	4
136	59620766	59620766	E0017	.ROLLER BEARING		EA	4
137				DELETED			
138	59611074	59611074	E0017	.PIN, LOCK		EA	2
139	56910436-19	56910436-19	E0017	.WASHER, THRUST		EA	2
140	95020971-10	95020971-10	E0017	.BUSHING, PLAIN		EA	2
141	67124000-08	67124000-08	E0017	.PIN, 'SPIROL', HEAVY - 0.188 X - ATT.PT 0.50 LG		EA	2
142	59810811	59810811	E0017	.PIN		EA	2
143	59820813	59820813	E0017	.LOCK PLATE		EA	2
144	59616561	59616561	E0017	.BUSHING		EA	2
145	59620776-01	59620776-01	E0017	.BEARING, CAM FOLLOWER		EA	4
146	67123005-43	67123005-43	E0017	.NUT, HEX, JAM – 1/2 - 20 - SSTL - ATT.PT		EA	4
147	67122005-46	67122005-46	E0017	.LOCKWASHER, SPLIT-1/2, - ATT.PT 0.171 W X 0.125 THK - STL ZNP		EA	4
148	59620749	59620749	E0017	.CAM SPACER		EA	4
149	59630728	59630728	E0017	.SIDE PLATE, CARRIAGE		EA	2
150	59730151	59730151	E0017	.HEAT SHRINK TUBING, ADHESIVE LINED			AR
151	59631083	59631083	E0017	.SUPPORT ROD		EA	1
152	67123003-09	67123003-09	E0017	.NUT, HEX - 1/4-20 UNC - SSTL - ATT.PT		EA	1
153				DELETED			

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Bridgeplate Assy, RH (Fig. 4-42)

Section Figure Item	P/N	OEM P/N	OEM Code	Description	MBTA Code	U/M	Qty per Assy
04-042-154	59730162	59730162	E0017	.COILED CORD HARNESS		EA	1
155	59621351	59621351	E0017	.CABLE SPOOL		EA	2
156	59621349	59621349	E0017	.CABLE BRACKET		EA	1
157				DELETED			
158	67121091-18	67121091-18	E0017	.SCREW, FLAT HD - NO 6-32 X - ATT.PT 0.75 - STL ZNP		EA	4
159	67123003-05	67123003-05	E0017	.NUT, HEX - NO 6-32 - STL ZNP - ATT.PT		EA	4
160				DELETED			
161				DELETED			
162				DELETED			
163				DELETED			
164				DELETED			
165				DELETED			
166				DELETED			
167	59720675	59720675	E0017	.PROXIMITY SENSOR, PNP		EA	1
168	67121008-23	67121008-23	E0017	.SCREW, SEMS, SLTD - NO 4-40 - ATT.PT X 0.25 - STL ZNP		EA	2
169	17816944-03	17816944-03	E0017	.RESISTOR, 50 WATT, 10 OHMS ñ1%		EA	1
170	67121066-06	67121066-06	E0017	.SCREW, HEX SOCKET HD CAP - ATT.PT -1/4-20X0.75-STL ZNP		EA	6
171				DELETED			
172	59621350	59621350	E0017	.MOUNTING BRACKET, SENSOR		EA	1
173	56710106-17	56710106-17	E0017	.NUT, SELF-LOCKING - 5/16-18 - - ATT.PT STL ZNP		EA	2
174	57410215-63	57410215-63	E0017	.WASHER, SPECIAL		EA	2
175	59620734	59620734	E0017	.TENSIONER SHAFT		EA	2
176	59620767	59620767	E0017	.ROLLER BEARING		EA	4
177	59620735	59620735	E0017	.ROLLER		EA	2
178	59620738-01	59620738-01	E0017	.SPACER		EA	2
179	59710110	59710110	E0017	.SPACER		EA	2
180	59620764	59620764	E0017	.DRIVE BELT		EA	2
181	67111045-13	67111045-13	E0017	.SCREW, FLAT HD - NO 8-32 X - ATT.PT 0.50 - STL ZNP		EA	2
182	59611112	59611112	E0017	.WASHER - NO 8 - ATT.PT		EA	2
183	59631402	59631402	E0017	.BALLSCREW		EA	2
184	59621080	59621080	E0017	.DRIVEN PULLEY		EA	2
185	59710003	59710003	E0017	.DRIVE KEY		EA	2
186	59621084	59621084	E0017	.RING, RETAINING		EA	4
187	59620774	59620774	E0017	.BEARING UNIT		EA	2
188	59611069	59611069	E0017	.SPACER		EA	2

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Bridgeplate Assy, RH (Fig. 4-42)

Section Figure Item	P/N	OEM P/N	OEM Code	Description	MBTA Code	U/M	Qty per Assy
04-042- 189	67121066-64	67121066-64	E0017	.SCREW, HEX SOCKET HD CAP - ATT.PT - NO 8-32 X 0.625 - STL ZNP		EA	8
190	67122005-39	67122005-39	E0017	.LOCKWASHER, SPLIT - NO 8, - ATT.PT 0.055 W X 0.040 THK - STL ZNP		EA	8
191				DELETED			
192				DELETED			
193	59630765	59630765	E0017	.MOTOR, BRIDGEPLATE		EA	1
194	59621376	59621376	E0017	.MOUNTING PLATE, MOTOR		EA	1
195	97620117-77	97620117-77	E0017	.SCREW, TRQ PATCH - ATT.PT		EA	1
196	59621081	59621081	E0017	.DRIVE PULLEY		EA	1
197	59621084-01	59621084-01	E0017	.RING, RETAINING		EA	3
198	67121094-25	67121094-25	E0017	.SCREW, HEX SCH CAP - 5/16-18 X 0.88 - STL ZNP		EA	8
199				DELETED			
200				DELETED			
201				DELETED			
202	97710329-09	97710329-09	E0017	.NUT, HEX, LOCK - 7/16-20 - STL - ATT.PT CAD PL		EA	2
203	59611490	59611490	E0017	.SHOULDERED SCREW		EA	2
204	59620777	59620777	E0017	.ROLLER BEARING		EA	2
205	59620725	59620725	E0017	.GUIDE BLOCK		EA	2
206	67111045-01	67111045-01	E0017	.SCREW, FLAT HD RTT PT - 3/8-16 X 1.25 -STL ZNP		EA	10
207	67123003-13	67123003-13	E0017	.NUT, HEX - 3/8-16 UNC - SSTL - ATT.PT		EA	10
208				DELETED			
209	59720571	59720571	E0017	.HARNESS SUPPORT BRACKET, RH		EA	1
210	59840809	59840809	E0017	.ROLLER CHANNEL		EA	2
211				DELETED			
212	67121005-02	67121005-02	E0017	.SCREW, SEMS, SLTD - NO 8-32 - ATT.PT X 0.38 - STL ZNP		EA	1
213				DELETED			
214	57610055	57610055	E0017	.CABLE TIE CLAMP		EA	1
215	59641382	59641382	E0017	.SIDE TUBE, RH		EA	1
216	59641382-01	59641382-01	E0017	.SIDE TUBE, LH		EA	1
217	67121044-37	67121044-37	E0017	.SCREW, FLAT REC HD -1/4-20 - ATT.PT X 0.50 - SSTL		EA	4
218				DELETED			
219				DELETED			
220	59621374	59621374	E0017	.MOUNTING ANGLE		EA	2
221	59621379-01	59621379-01	E0017	.FITTING BRACKET (USED ON LH BRIDGEPLATE)		EA	1
222				DELETED			
223				DELETED			

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Bridgeplate Assy, RH (Fig. 4-42)

Section Figure Item	P/N	OEM P/N	OEM Code	Description	MBTA Code	U/M	Qty per Assy
04-042-224	59631377	59631377	E0017	.MOUNTING BRACKET, SIDE TUBE		EA	2
225	59641381	59641381	E0017	.REAR TUBE		EA	1
226	59730161	59730161	E0017	.BRIDGEPLATE HARNESS		EA	1
227	97620117-96	97620117-96	E0017	.SCREW, TRQ PATCH - ATT.PT		EA	8
228	59720447	59720447	E0017	.CABLE GUIDE		EA	4
229				DELETED			
230				DELETED			
231	59710055	59710055	E0017	.SPACER		EA	1
232	59720099	59720099	E0017	.WIRE GUIDE		EA	1
233				DELETED			
234				DELETED			
235	97410750	97410750	E0017	.CABLE POLE		EA	3
236				DELETED			
237				DELETED			
238				DELETED			
239				DELETED			
240	59621373	59621373	E0017	.REAR ANGLE		EA	1
241	59621375	59621375	E0017	.TAPPING PLATE		EA	1
242				DELETED			
243				DELETED			
244	59621370	59621370	E0017	.MOUNTING PAD, BEARING		EA	2
245				DELETED			
246				DELETED			
247	56216381-04	56216381-04	E0017	.GROMMET		EA	1
248	98116769-13	98116769-13	E0017	.THREADED RIVET - (N.I.)		EA	12
249				DELETED			
250	97521938-97	97521938-97	E0017	.LABEL, IDENTIFICATION		EA	1
251	97511914-04	97511914-04	E0017	.LABEL, REVISION (E)		EA	1

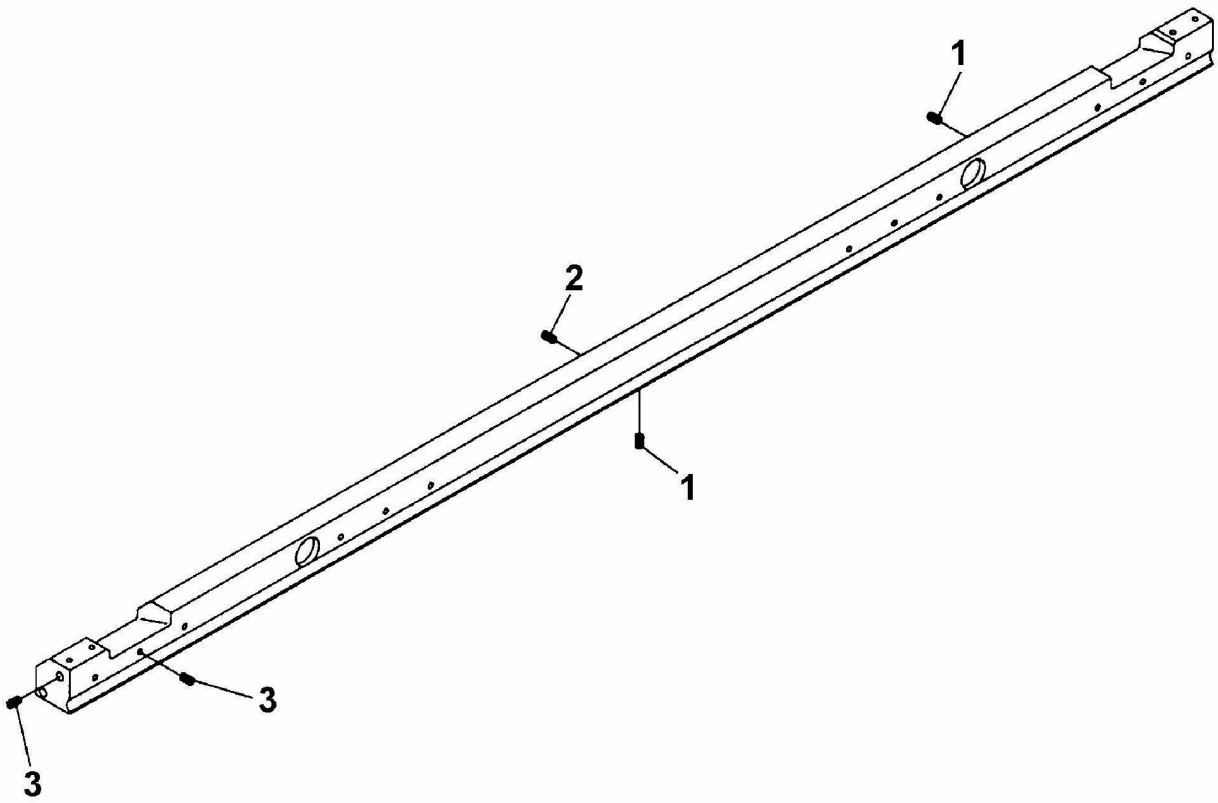

Figure 4-43 Front Bar

Front Bar (Fig. 4-43)

Section Figure Item	P/N	OEM P/N	OEM Code	Description	MBTA Code	U/M	Qty per Assy
04-043-	59640722	59640722	E0017	FRONT BAR - SEE Figure 4-42 FOR NHA		EA	1
1	97421568-01	97421568-01	E0017	.INSERT, HELICOIL		EA	10
2	97421568-10	97421568-10	E0017	.INSERT, HELICOIL		EA	2
3	97421568	97421568	E0017	.INSERT, HELICOIL		EA	16
4				DELETED			

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SECTION 4

DOORS AND BRIDGEPLATE

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SECTION 4

DOORS AND BRIDGEPLATE

4-1 Abbreviations, Acronyms and Symbols

4-1.1 List of Abbreviations, Acronyms and Symbols

The Abbreviations, Acronyms and Symbols commonly used throughout this section are given below with their relevant meaning.

Abbreviation	Meaning
AC	Alternating current
Art. Sect.	Articulation Section
CB	Circuit Breaker
Cont'd	Continued
CSV	Coupling (Duplex) Solenoid Valve
DC	Direct Current
DTE	Diagnostic Test Equipment
Fig./fig	Figure
Ft	Foot (Linear Measure)
IWD	Integrated Wiring Diagrams
KN	Kilo Newton (Weight measure)
lb	Pound (Weight Measure)
lb-ft	Torque unit measure
LH	Left Hand
LRV	Light Rail (Transit) Vehicle
m	Meter
Max	Maximum
MBTA	Massachusetts Bay Transportation Authority
MSV	(Single) Solenoid Valve (for Mechanical Uncoupling)
Min	Minimum
MM	Maintenance Manual
mm	Millimeters
mph	Miles per hour
MRP	Main Reservoir Pipe
N	Newton
NC	Normally Closed
NO	Normally Open
PSI	Pounds per Square Inch
para(s)	Paragraph(s)
P/N	Part Number
RH	Right Hand

List of Abbreviations, Acronyms and Symbols (cont'd)

Abbreviation	Meaning
T/L or TL	Trainline
UCSV	Uncoupling (Duplex) Solenoid Valve
VAC	Volt Alternating Current
VDC	Volt Direct Current

4-1.2 List of Definitions

The Definitions commonly used throughout this section are given below with their related meaning.

Definition	Meaning
"A" Body Section	The half of an articulated vehicle containing the pantograph
"A" Cab	Operator's Cab located in the "A" Body Section.
"A" – TK	The motor truck installed under "A" Body Section.
"B" Body Section	The half an articulated vehicle not containing the pantograph.
"B" Cab	Operator's Cab located in the "B" Body Section.
"B" – TK	The motor truck installed under "B" Body Section.
"C" – TK	The trailer truck installed under the articulation.
Catenary	Overhead power supply consisting of a combination of conductors and other hardware suspended above the tracks by means of cantilevers and wayside structures.
Console	The control panel located in the cab directly in front of the Operator's Seat.
Corrective Maintenance	The actions performed, as a result of a failure to restore an item to a specified condition.
Failure	The inability of a system, subsystem, assembly, or component to perform its required function.

High Voltage ..... High voltage 600 VDC.

List of Definitions (cont'd)

Definition	Meaning
Lead Cab	The controlling cab in a vehicle of the train consist.
Lead Vehicle	In the direction of travel, the forward-most vehicle of the train consist.
Left Hand	Left side of transit vehicle when one looks toward the "A" Body Section Operator's cab from inside the vehicle.
Low Voltage	The voltage used for most auxiliary equipment on the vehicle, usually between 24 and 45 VDC.
Operator	Individual on board who is responsible for train operation in manual modes and for overseeing train operation in automatic mode.
Pantograph	A device used for current collection from a catenary system. It consists of a dual-strip electrical collection shoe carried by a collapsible and adjustable frame.
Right Hand	Right side of the transit vehicle when one looks toward the "A" Body Section Operator's cab from inside the vehicle.
Trailer Truck	The truck installed under the articulation section.
Train Consist	Composed of a Min. of 1 and a Max. of 4 interconnected vehicles.
Trainline	The means of sending a signal to all vehicles in a consist via a continuous electrical or fluid circuit connected by suitable coupling devices.
Vehicle	Composed of "A" Body Section + "C" Articulation Section + "B" Body Section.
Zero Speed	Vehicle velocity of less than 2 mph for more than 1 second.

4-2 Doors

4-2.a Description and Operation

The vehicle is equipped with six doors (three per each “A” / “B” Body Section), eachone subdivided in three main components (Refer to Figure 4-2.2):

- Door Module Assembly. The Door Module Assemblies consists in two different modules: one 42” door module (A1 and B1 Doors) and two 50” door modules (A2, A3, B2 and B3 Doors) (Refer to Figure 4-2.1).
- Bridgeplate Equipment. The Bridgeplate Equipment consists of two bridgeplate assemblies installed at A2, A3, B2, and B3 Doors (Refer to Figure 4-2.1).
- Door Control Module (DCM). One DCM is installed per each door (A1, A2, A3, B1, B2 and B3 Doors). The module is designed to open/close the doors, and to deploy/retracts the bridgeplate in the proper sequence. The DCM is also provided with RS232 serial port for PTU connection (Refer to Figure 4-2.2).

The door controls and all door equipment are interchangeable from one doorway to any other doorway of similar size, and from vehicle to vehicle. The door control system provided for the No. 8 LFC is operationally compatible with the No. 7 LFC to allows No. 7 LFC and No. 8 to operate in revenue service in mix train consists. The door system is designed to operate at 37.5 VDC power supply.

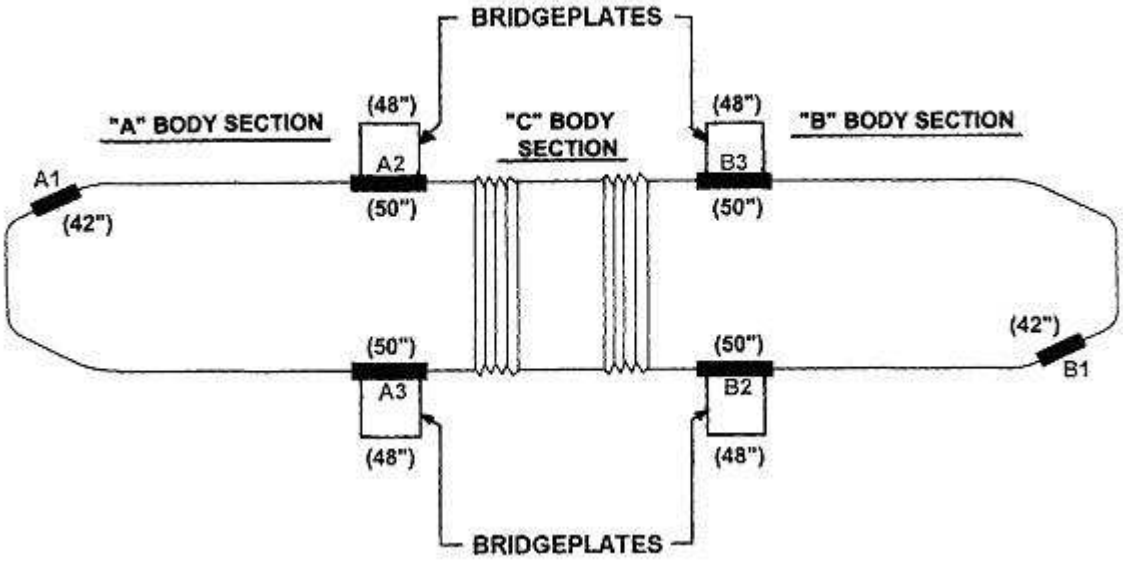

Figure 4-2.1 Doors and Bridgeplate – Location (Sheet 1 of 4)

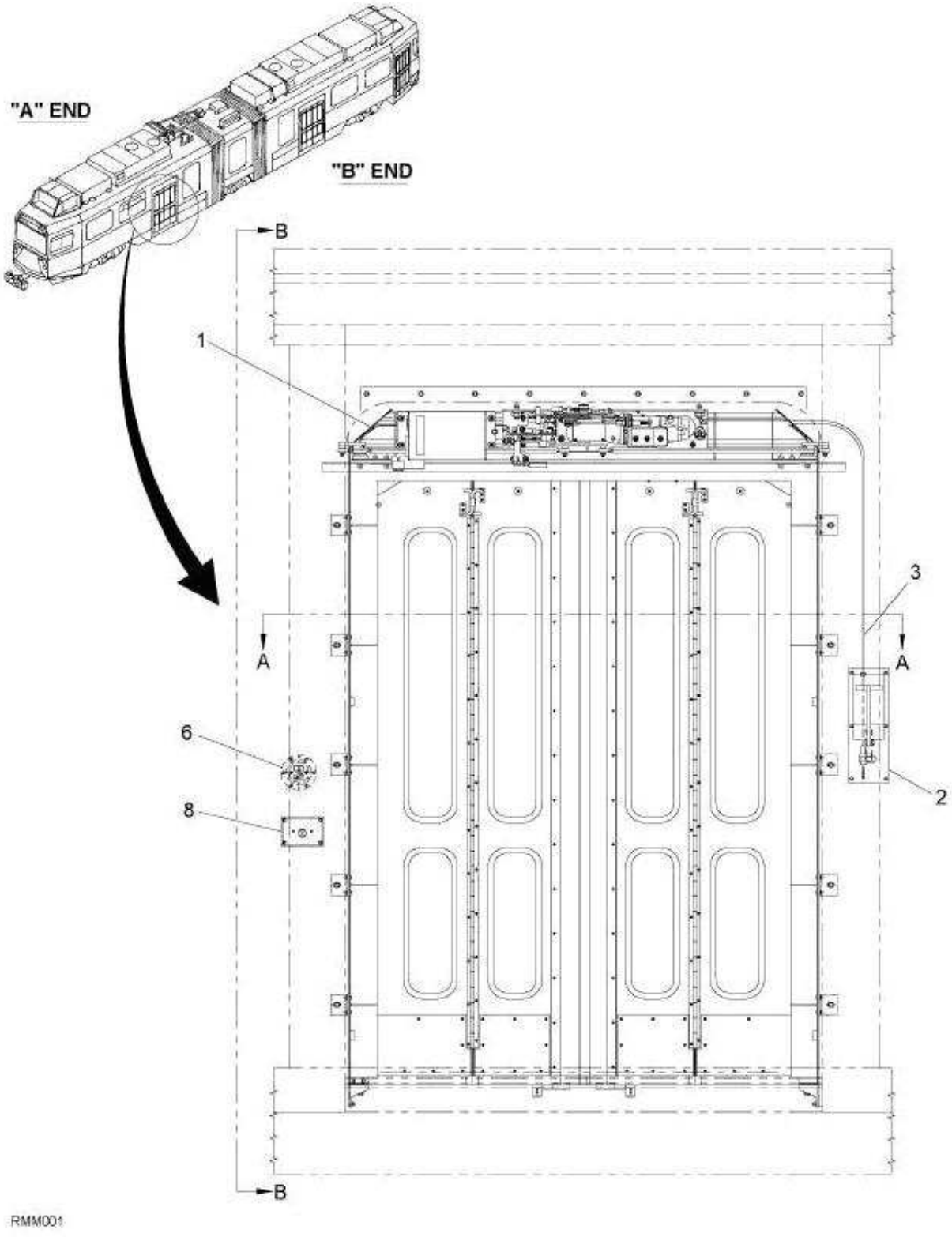

Figure 4-2.1 Doors and Bridgeplate – Location (Sheet 2 of 4)

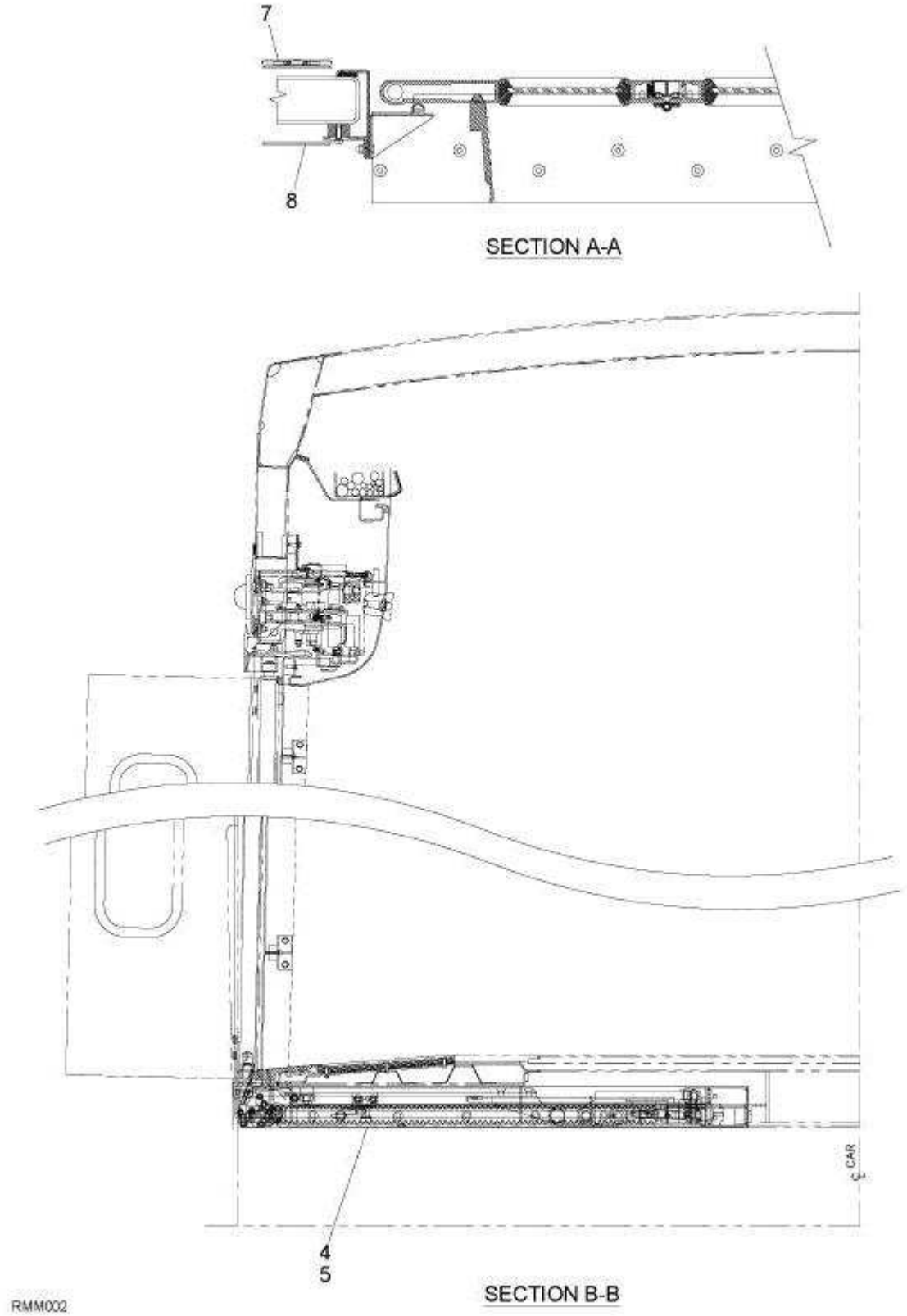

Figure 4-2.1 Doors and Bridgeplate – Location (Sheet 3 of 4)

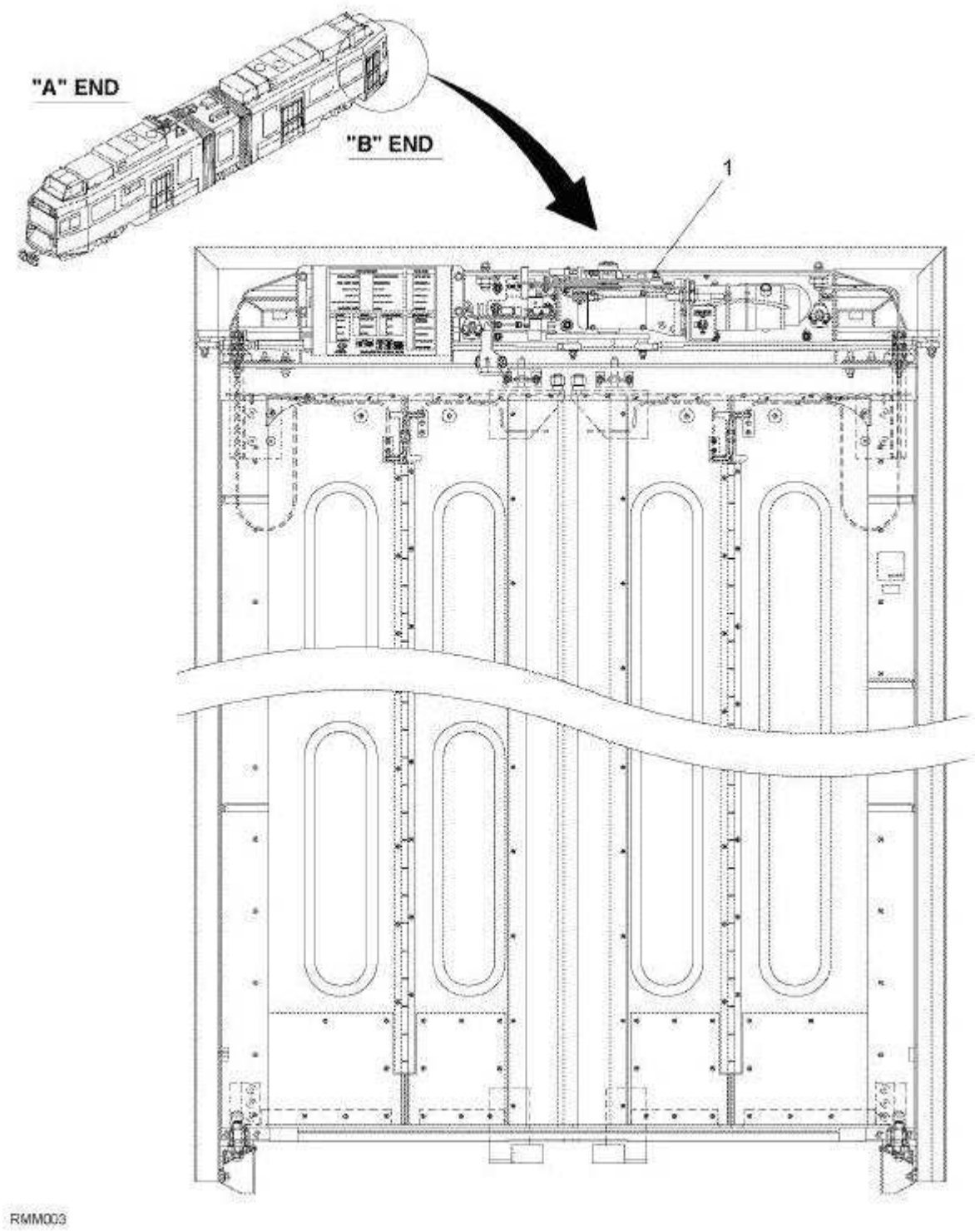

Figure 4-2.1 Doors and Bridgeplate – Location (Sheet 4 of 4)

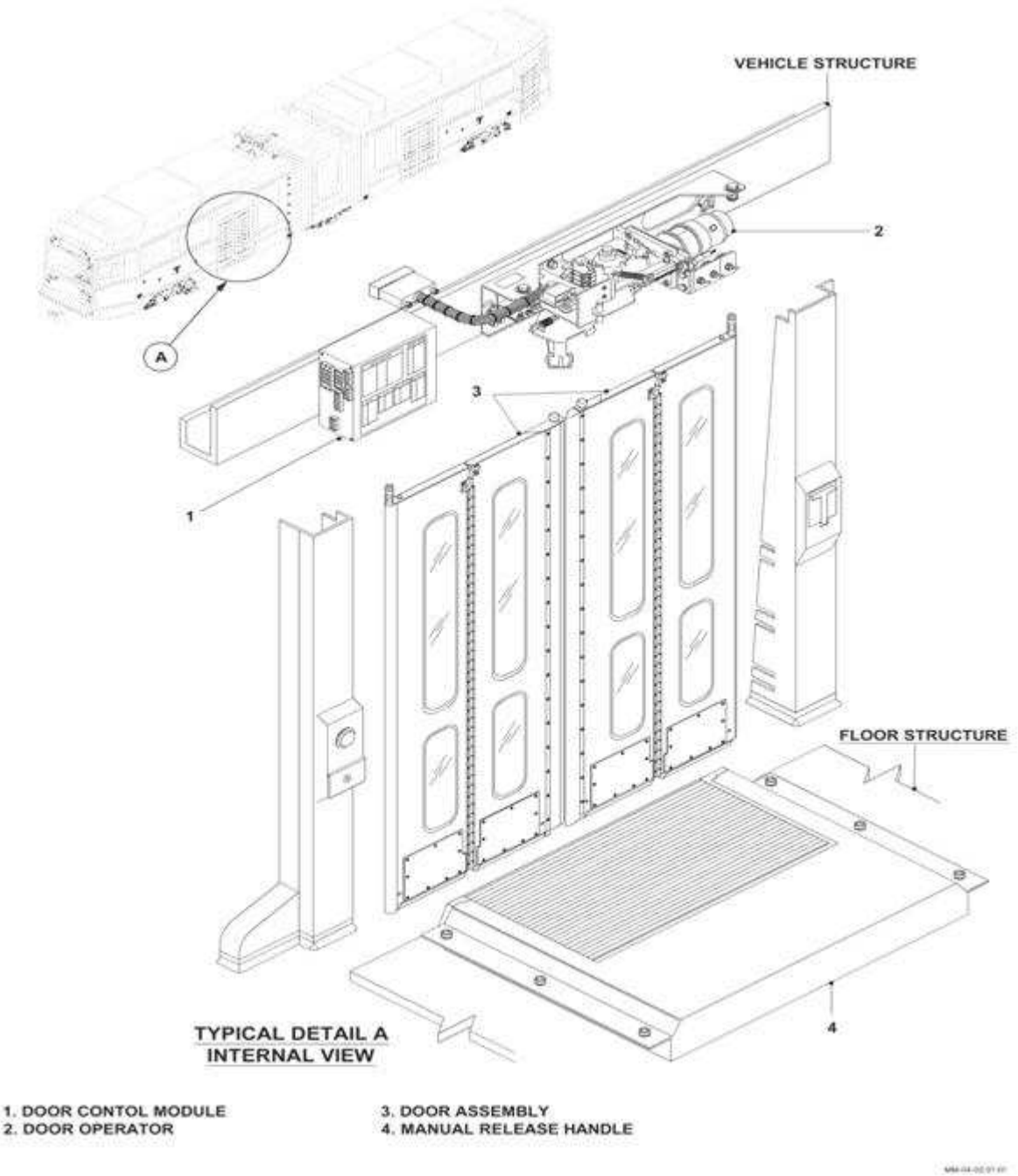

Figure 4-2.2 Door System - Main Components Location

4-2.b Specific Safety Precautions

> **WARNING: DURING DOOR AND BRIDGEPLATES SYSTEM TEST PROCEDURE THE HIGH VOLTAGE IS CONNECTED TO THE VEHICLE. FOLLOW MBTA REGULATIONS TO AVOID UNSAFE CONDITIONS.**

4-2.c Fault isolation

a) General

The purpose of this troubleshooting section is to provide the information needed to trace a failure from its initial symptom to its actual cause in order to return the door system to proper function as quickly as possible. Specific troubleshooting procedures are provided in the tables in this section.

There are four basic failure modes for the door system. These are:

- The car doors are closed and locked, but the car cannot be moved;
- A car door is open, but the car will move;
- A car door system, which includes the bridgeplate, will not operate;
- A car door system, which includes its bridgeplate, operates, but does not operate correctly.

These base faults are fault isolated in troubleshooting Table 4-2.1 through Table 4-2.6, below. Use these tables, the information provided by the LEDs on the door control module front panel, the door system schematics provided in section 3 of MM, and the portable test unit to determine the cause of the problem and the corrective actions required for eliminating the problem.

> **WARNING: DURING DOOR SYSTEM FAULT ISOLATION / REPAIR PROCEDURE THE HIGH VOLTAGE IS CONNECTED TO THE VEHICLE. FOLLOW MBTA REGULATIONS TO AVOID UNSAFE CONDITIONS.**

b) Vehicle Cannot Be Moved

Vehicle movement is not enabled unless the bridgeplates are all stowed and locked, and the car doors are closed and locked. Sensors and switches provide this information to the door controller, and the door controller forwards the information to the train controller. This information becomes the basis for troubleshooting this condition.

Table 4-2.1 Vehicle Cannot Be Moved With Doors Closed and Locked – Fault Isolation/Repair

Malfunction Symptom	Probable Cause	Corrective Action
1. Car doors closed and locked, but the vehicle cannot be moved.	1. Check inputs to the door controller from the switches and sensors listed below, and the corresponding inputs to the train control system from the controller.	
	2. Check for inputs to the controller from each bridgeplate STOWED sensor.	1. If any inputs are missing, align or replace the STOWED sensor, as applicable. If no inputs are missing, see check 2.
	3. Check for outputs to the train control system corresponding to each input to the door controller from the bridgeplate STOWED sensors.	1. If an output is missing, replace the controller. If no outputs are missing, see check 3.
	4. Check for inputs to the controller from each bridgeplate LOCKED switch.	1. If any inputs are missing, replace the LOCKED switch, as applicable. If no inputs are missing, see check 4.

Malfunction Symptom	Probable Cause	Corrective Action
	5. Check for outputs to the train control system corresponding to each input to the door controller from the bridgeplate LOCKED switches.	1. If an output is missing, replace the controller. If no outputs are missing, see check 5.
	6. Check for inputs to the controller from each door CLOSED sensor.	1. If any inputs are missing, replace the CLOSED sensor, as applicable. If no inputs are missing, see check 6.
	7. Check for outputs to the train control system corresponding to each input to the door controller from the door CLOSED sensors.	1. If an output is missing, replace the controller. If no outputs are missing, see check 7.
	8. Check for inputs to the controller from each door LOCKED (overcenter) switch	1. If any inputs are missing, replace the CLOSED switch, as applicable. If no inputs are missing, see check 8.
	9. Check for outputs to the train control system corresponding to each input to the door controller from the door LOCKED switches.	1. If an output is missing, replace the controller. If no outputs are missing, the fault is between the door controller and the train controller.

c) Vehicle Moves with Doors Open

Vehicle movement cannot be enabled unless the bridgeplates are all stowed and locked, and the car doors are closed and locked. Sensors and switches provide this information to the door controller, and the door controller forwards the information to the train controller. This information becomes the basis for troubleshooting this condition. If this condition exists, the fault will usually be found in either the door controller or the train controller because multiple switch/sensor failures are not likely.

Table 4-2.2 Vehicle Moves with Doors Open - Fault/Isolation/Repair

Malfunction Symptom	Probable Cause	Corrective Action
1. Car doors are not closed and locked, but the vehicle can be moved.	1. Determine which door or bridgeplate is not properly closed and locked or stowed and locked.	
	2. Check the outputs from the door controller to the train control system from the controller.	1. If no outputs are missing, the fault is in the train controller. If there are outputs missing, see check 2.
	3. Check the inputs to the door controller. If the bridgeplate is not STOWED and LOCKED, there should be no STOWED and LOCKED inputs to the controller. If the doors are not CLOSED and LOCKED, there should be no CLOSED and LOCKED inputs to the door controller.	1. If the STOWED/ LOCKED inputs and the CLOSED/LOCKED inputs are not present at the controller but the corresponding outputs are, the fault is in the controller. 2. If there are STOWED/ LOCKED inputs from a bridgeplate that is not STOWED and LOCKED, the sensor or switch supplying that input has failed. Replace the failed component. 3. If there are CLOSED/LOCKED inputs from a door that is not CLOSED and LOCKED, the sensor or switch supplying that input has failed Replace the failed component.

d) Vehicle Doors Inoperable

The train car doors can only open if the TRAIN STOPPED signal is present, and DOOR OPEN command is provided to the controller from the train controls or from one of the adjacent crew switches. The fault isolation for the doors is based on these prerequisites.

Table 4-2.3 Vehicle Doors Do Not Operate - Fault Isolation/Repair

Malfunction Symptom	Probable Cause	Corrective Action
1. Car doors do not operate when commanded.	1. Verify that the TRAIN STOPPED signal is present, and that the DOOR OPEN command signal is present at the door operator controller.	
	2. Check the door operator circuit breaker.	1. If the circuit breaker is open, the door operator has experienced current above 17.5 amperes. The overcurrent condition can be caused by a variety of mechanical failures as well as an electrical failure in the motor. Close the circuit breaker, restore power to the door system, and proceed with the checks, beginning with check 2, until the cause of the failure is identified.
	3. Check that the door out-of-service mechanism has not been set to out-of-service, and that the door motor power switch is ON. Check the input to the controller from the door out-of-service switch	1. If necessary, correct the door out-of-service setting and/or the door motor power switch setting. If these settings were correct, see check3 If there is an input to the controller from the door out-of-service switch, the switch is defective. If there is no input to the controller from the door out-of-service switch, see check 4.

Malfunction Symptom	Probable Cause	Corrective Action
	4. Visually inspect the door operating linkage, hinges, and locking mechanism for damage.	1. If the door operating linkage, hinges, and locking mechanism are damaged, repair or replace the damaged components, as applicable. If there is no damage, see check 5.
	5. Check for power to the motor and gearbox.	1. If there is no power to the motor, make appropriate repairs to restore power to the motor. If there is power to the motor, see check 6.
	6. Provide 37 VDC to the motor briefly, and check the motor current	1. If there is no current, there is an open circuit in the motor. Replace the motor. 2. If there is current to the motor and the doors will not operate, the motor will trip Circuit Breaker again. With no damage to the operating mechanism, the fault is in either the gearbox or the motor. Replace the gearbox and motor

e) Vehicle Doors Do Not Operate Correctly

The vehicle door can only open if the TRAIN STOPPED signal is present, and DOOR OPEN command is provided to the controller from the train controls or from one of the adjacent crew switches. The car doors must meet specific opening and closing times, and must operate smoothly and without binding. The fault isolation for the doors is based on these prerequisites.

Table 4-2.4 Vehicle Doors Do Not Operate Correctly - Fault Isolation/Repair

Malfunction Symptom	Probable Cause	Corrective Action
1. The doors operate slowly.	1. Check the voltage to the motor. For normal operation, the voltage should be 37.5 VDC, nominal.	1. If the voltage is low, correct the low voltage condition. If the voltage is correct, see check 2.
	2. Check the motor current.	1. The motor current should be high, which indicates a drag on the system mechanical components. See check 3.
	3. Inspect the operating system for damage and corrosion in the bearings and hinges, and misalignment or interference in track and roller.	1. If there is damage or corrosion in the bearings and hinges, the applicable damaged/corroded components must be replaced. If there is misalignment or interface in the track and roller, or with any other components, correct the misalignment or interface condition. 2. If there is no damage, corrosion, misalignment, or interference, the problem is in the gearbox or the motor. Replace the gearbox and motor.

Table 4-2.4 Vehicle Doors Do Not Operate Correctly - Fault Isolation/Repair (Cont'd)

Malfunction Symptom	Probable Cause	Corrective Action
2. The doors operate at uneven speed.	1. Check the operating mechanism for damage, corrosion, interference and misalignment.	1. If there is damage, corrosion, interference or misalignment, correct the condition. Replace the appropriate components, or correct the interface and misalignment. 2. If there is no damage, corrosion, interference or misalignment in the operating mechanism, the fault is in the gearbox or motor. Replace the gearbox and motor.
3. The doors will not close and lock.	1. Check the operating mechanism for damage, corrosion, interference and misalignment.	1. This is usually caused by either an interference condition, i.e., something is preventing the mechanism from completing its movement, or misalignment. If the door has been closing and locking correctly, the probable cause is interference. If the door is newly installed, the probable cause is misalignment. 2. For damage or corrosion, replace the appropiate components.

Malfunction Symptom	Probable Cause	Corrective Action
4. The doors will not open completely.	1. Check the operating mechanism for damage, corrosion, interference and misalignment.	1. This is usually caused by either an interference condition, i.e., something is preventing the mechanism from completing its movement, or misalignment. If the door has been opening correctly, the probable cause is interference. If the door is newly installed, the probable cause is misalignment. 2. For misalignment, refer to the alignment procedure in para 4-2.i 3. For damage or corrosion, replace the appropriate components.
5. The doors recycle when there is no obstacle in the doorway.	1. Check the door alignment to make sure the sensitive edges are not contacting each other before the controller disables the sensitive edge switch circuit.	1. If door alignment allows contact of the sensitive edges before the sensitive edge switch circuit is disabled, realign the doors according to the procedure in para 4-2.i 2. If the doors are properly aligned, see check 6.
	2. Lift an electrical connection at each sensitive edge switch to prevent the sensitive edge switches from recycling the doors as they contact each other a the doors close. Cycle the doors closed	1. If the doors close and lock, correct the fault with the sensitive edge disabling circuit.

f) Emergency Release Mechanisms do not operate correctly

The emergency release mechanism on the door operator can be actuated independently by the emergency release handle inside the car (A2 and A3, B2 and B3 doorways), by the emergency release handle outside the car (A1 and B1 doorways) and by the emergency release handle on the door operator. The fault isolation for the doors is based on these factors.

Table 4-2.5 Emergency Release Mechanisms Do Not Operate Correctly - Fault Isolation/Repair

Malfunction Symptom	Probable Cause	Corrective Action
1. The emergency release provisions do no operate correctly.	1. Check the door and door mechanical linkages for damage, interference, and misalignment. 2. Check the door emergency release mechanisms beginning at the emergency handles and working to the door operator. Check for damage, misalignment and corrosion.	1. If the door and door mechanical linkages are in alignment and do not have any damage or ob-structions, see check 2. 1. If there is any damage, misalignment, interference, or corrosion, correct the condition and recheck the emergency release mechanisms. 2. If the release mechanisms are not damaged or misalignment, see check 3.

Malfunction Symptom	Probable Cause	Corrective Action
	3. For any door, first actuate the emergency release mechanism from the handle on the door operator. The release mechanism must operate smoothly, and unlock and slightly open the car doors, even if the door out-of-service mechanism has been actuated. The handle must remain firmly over center until it is returned to the NORMAL position.	1. If the door emergency release does not operate smoothly, or does not unlock and slightly open the doors, remove and replace the door operator. 2. If the door operator emergency release handle does operate correctly, see check 4.
	4. Check the function of the outside emergency door release according to procedure of para 4-2.i Check the function of the inside emergency door release according to procedure of para 4-2.i	1. If the door does no unlock and open properly, or if the force to release the doors exceeds 45 lb, remove and check the manual release mechanism. 2. If the manual release handle operates correctly, remove and replace the manual release cable. Make sure the manual release cable is correctly routed and adjusted.

g) Door Out-Of Service Mechanism Does Not Operate Correctly

With the doors closed, the door out-of-service mechanism on the door operator must lock the door when actuated. With the doors nearly closed, the door out-of-service mechanism must close and lock the door when actuated. In the out-of-service position, the door out-of-service mechanism must contact and open the door out-of-service switch, which removes power from the motor. The fault isolation for the door out-of-service mechanism is based on these factors.

Table 4-2.6 Door Out-Of Service Mechanism Does Not Operate Correctly - Fault Isolation/Repair

Malfunction Symptom	Probable Cause	Corrective Action
1. The door out-of-service mechanism does not operate correctly.	1. For any door, move the doors to the nearly closed position. Move the door out-of-service handle to the out-of-service position. The doors must close completely, and the teeter plate must move the overcenter (locked) position. The door out-of-service switch, removing power from the motor.	1. If the door out-of-service mechanism does not close and lock the door, remove and replace the door operator. 2. If the door out-of-service mechanism does not contact and actuate the door out-of-service switch, correctly align the switch and repeat the check. 3. If the door out-of-service switch is contacted and actuated, but does not remove power from the motor, remove and replace the door out-of-service switch and repeat the check.

4-2.d Disassembly

Since the Door System consists of separate items, the disassembly procedure is described in the para(s) related to each item, as shown in Table 4-2.7.

Table 4-2.7 Door System Components – Disassemble

Components	Para(s)
Door Module Assembly Equipment	4-2.1.d
Bridgeplate Equipment	4-2.2.d
Door Control Module (DCM)	4-2.3.d

Observe the general overhaul instructions provided below during overhaul of any door and bridgeplate system component.

Overhaul of all components is accomplished by parts replacement at assembly.

Before beginning reassembly, gather all the parts required for complete rebuild of the component. Make sure all expendables, all special tools, and all fixtures required to rebuild and test the component are available.

Replace all threaded fasteners, O-rings, retaining rings, switches, bearings, bushings, solenoids, and age sensitive components at overhaul. These have been discarded as part of the disassembly for overhaul. Make sure none of these parts is reused during an overhaul.

Replace any part that is corroded, or if the corrosion protection is worn through.

Make sure all threaded fasteners are properly retained using self-locking devices, lockwashers, thread locking compounds, or lockwire, as defined in the assembly instructions.

Perform all in-process checks as defined in the specific reassembly instructions.

4-2.e Cleaning/Painting

Since the Door System consists of separate items, the Cleaning procedure is described in the para(s) related to each item, as shown in Table 4-2.8.

For Vehicle Interior Cleaning Procedure refer to Section 2 of this Manual

Table 4-2.8 Door System Components – Cleaning/Painting

Components	Para(s)
Door Module Assembly Equipment	4-2.1.e
Bridgeplate Equipment	4-2.2.e
Door Control Module (DCM)	4-2.3.e

4-2.f Inspection

Since the Door System consists of separate items, the Inspection procedure is described in the para(s) related to each item, as shown in Table 4-2.9.

Table 4-2.9 Door System Components – Inspection

Components	Para(s)
Door Module Assembly Equipment	4-2.1.f
Bridgeplate Equipment	4-2.2.f
Door Control Module (DCM)	4-2.3.f

4-2.g Repair (Not Applicable)

4-2.h Reassembly

Since the Door System consists of separate items, the Reassembly procedure is described in the para(s) related to each item, as shown in Table 4-2.10.

Table 4-2.10 Door System Components – Reassembly procedure

Components	Para(s)
Door Module Assembly Equipment	4-2.1.h
Bridgeplate Equipment	4-2.2.h
Door Control Module (DCM)	4-2.3.h

4-2.i Adjustment/Test

a) Adjustment

Since the Door System consists of separate items, the Adjustment procedure is described in the para(s) related to each item, as shown in Table 4-2.11

Table 4-2.11 Door System Components – Adjustment

Components	Para(s)
Door Module Assembly Equipment	4-2.1.ia)
Bridgeplate Equipment	4-2.2.ia)
Door Control Module (DCM)	4-2.3.ia)

b) Test

Since the Door System consists of separate items, the Test procedure is described in the para(s) related to each item, as shown in Table 4-2.12.

Following are provided two tests:

- Doors System Test (Using the Door System Test Box)

  Doors System Test (Normal Operating Test)

Table 4-2.12 Door System Components – Test

Components	Para(s)
Door Module Assembly Equipment	4-2.1.i b)
Bridgeplate Equipment	4-2.2.ib)
Door Control Module (DCM)	4-2.3.ib)

DOORS SYSTEM TEST (USING THE DOOR SYSTEM TEST BOX)

WARNING: DURING DOOR SYSTEM TEST PROCEDURE THE HIGH VOLTAGE IS CONNECTED TO THE VEHICLE. FOLLOW MBTA REGULATIONS TO AVOID UNSAFE CONDITIONS.

- **Reference Information.**
  1. Tools / Equipment.
     – Door System Test Box.
  2. Material (Not Applicable).
- **Procedure - Door Operator Test Setup**

  To perform Door Operator Test Setup proceed as follows:

  1. Make sure the door operator is in the overcenter position. If it is not, put it in the overcenter position manually.
  2. With the power supply OFF, set the power supply to 40 VDC.
  3. Connect the test box 50 pin connector to the door operator 50 pin connector.
  4. Place the door operator switches (bridgeplate out-of-service [BPOOS], bridgeplate motor power switch [BMPS], and motor power switch [DMPS]) to OFF or NORMAL. For the doors without bridgeplates, place the DMPS to OFF.
  5. Place the test box OPEN/CLOSE switch in the CLOSE position.
  6. Perform the test procedure in Table 4-2.13 with the power supply set at 40 VDC.
  7. Lower the supply voltage to 25 VDC and repeat the test procedure.

  The door system must be within limits for all tests at both voltages.

Table 4-2.13 Door System Functional Testing

Test Step	Test Fixture Switch Position	Door Operator Switch and Circuit Breaker 1 Position	Lamp Status, 59660941	Lamp Status, 59660941-01	Comments / Instructions
1	CLOSE	BPOOS -- NORMAL BMPS -- OFF DMPS -- OFF CB1 – OFF	No lamps illuminated	No lamps illuminated	At setup, make sure the test box switch is in the CLOSE position.
2	CLOSE	BPOOS -- NORMAL BMPS -- OFF DMPS -- OFF CB1 – OFF	2, 4, 13	2, 4, 13	Set the power supply to ON.
3	CLOSE	BPOOS -- BYPASS BMPS -- OFF DMPS -- OFF CB1 – OFF	2, 4, 13	Not applicable	
4	CLOSE	BPOOS -- BYPASS BMPS -- ON DMPS -- OFF CB1 – OFF	2, 4, 14, 15	Not applicable	
5	CLOSE	BPOOS -- BYPASS BMPS -- ON DMPS -- OFF CB1 – OFF	2, 4, 8, 11, 12, 13, 14, 15	2, 4, 8, 13, 14	
6	CLOSE	BPOOS -- BYPASS BMPS -- OFF DMPS -- OFF CB1 – ON	2, 4, 8, 12, 13, 14	Not applicable	
7	CLOSE	BPOOS -- NORMAL BMPS -- OFF DMPS -- OFF	2, 4, 8, 13, 14	2, 4, 8, 13, 14	

Test Step	Test Fixture Switch Position	Door Operator Switch and Circuit Breaker 1 Position	Lamp Status, 59660941	Lamp Status, 59660941-01	Comments / Instructions
		CB1 – ON			
8	CLOSE	BPOOS -- NORMAL BMPS -- OFF DMPS -- OFF CB1 -- ON	1, 2, 3, 4, 6, 13, 14	1, 2, 3, 4, 6, 13, 14	Actuate the door out-of-service lever.
9	CLOSE	BPOOS -- NORMAL BMPS -- OFF DMPS -- OFF CB1 -- ON	2, 4, 8, 13, 14	2, 4, 8, 13, 14	Return the door-out-of-service lever to NORMAL
10	CLOSE	BPOOS -- NORMAL BMPS -- OFF DMPS -- OFF CB1 -- ON	2, 4, 5, 8, 9, 13, 14	2, 4, 5, 8, 9, 13, 14	Actuate the sensitive edge pressure switches and observe the lamps. SES1 must illuminate L5; SES2 must illuminate L9.
11	CLOSE	BPOOS -- NORMAL BMPS -- OFF DMPS -- OFF CB1 -- ON	7, 8, 14	7, 8, 14	Move the door operator EMERGENCY RELEASE lever toward the emergency open position and verify that the door operator is free to move. Return the lever to the overcenter position.
12	CLOSE	BPOOS -- NORMAL BMPS -- OFF DMPS -- OFF CB1 -- ON	2, 4, 8, 13, 14	2, 4, 8, 13, 14	
13	OPEN	BPOOS -- NORMAL BMPS -- OFF DMPS -- ON	2, 4, 8, 10, 14	2, 4, 8, 10, 14	Press the RESET button on the test box. The door operator must cycle

Test Step	Test Fixture Switch Position	Door Operator Switch and Circuit Breaker 1 Position	Lamp Status, 59660941	Lamp Status, 59660941-01	Comments / Instructions
		CB1 – ON			open.
14	CLOSE	BPOOS -- NORMAL BMPS -- OFF DMPS -- ON CB1 – ON	2, 4, 8, 10,13, 14	2, 4, 8, 10, 13, 14	The door operator must close.
15	OPEN	BPOOS -- NORMAL BMPS -- OFF DMPS -- ON CB1 – ON	1, 2, 3, 4, 6, 10, 13, 14	1, 2, 3, 4, 6, 10, 13, 14	Move the door operator EMERGENCY RELEASE lever to the emergency open position. Press the test box RESET button. The door operator must remain in the closed position.
16	OPEN	BPOOS -- NORMAL BMPS -- OFF DMPS -- ON CB1 – ON	2, 4, 8, 14	2, 4, 8, 14	Return the door operator EMERGENCY RELEASE lever to the NORMAL position. The door operator must be open.
17	CLOSE	BPOOS -- NORMAL BMPS -- OFF DMPS -- ON CB1 – ON	2, 4, 8, 14	2, 4, 8, 14	The door operator must close.

Table 4-2.13 Door System Functional Testing (Cont'd)

Test Step	Test Fixture Switch Position	Door Operator Switch and Circuit Breaker 1 Position	Lamp Status, 59660941	Lamp Status, 59660941-01	Comments / Instructions
18	CLOSE	BPOOS -- NORMAL BMPS -- OFF DMPS -- ON CB1 -- ON	2, 4, 8, 10, 13, 14	2, 4, 8, 10, 13, 14	The door operator must open.
19	CLOSE	BPOOS -- NORMAL BMPS -- OFF DMPS -- ON CB1 – ON	2, 4, 8, 14	2, 4, 8, 14	The door operator must close.

DOORS SYSTEM TEST (NORMAL OPERATING TEST)

> **WARNING: DURING DOOR SYSTEM TEST PROCEDURE THE HIGH VOLTAGE IS CONNECTED TO THE VEHICLE. FOLLOW MBTA REGULATIONS TO AVOID UNSAFE CONDITIONS.**

- **Reference Information.**
  1. Tools / Equipment.
     - Door System Test Box.
     - MBTA Carhouse Standard Tools Kit.
  2. Material (Not Applicable).

External Emergency Door Release System Test

To perform External Emergency Door Release SystemTest Setup proceed as follows:

1. Set the Vehicle in safety condition in accordance with MBTA Carhouse Regulations.
   - Switch OFF the Battery Circuit Breaker (CB 3Q03 – Battery Box).
2. Using the crew key, open the outside emergency release door.
3. Pull the emergency release handle. The car doors must unlock and open far enough that they can be opened by hand.
4. Close the doors, making sure the doors are completely closed and locked.
5. Attach the pull tester tool to the manual release handle.
6. Pull on the tester with an even pressure at downward angle of approximately 45 degrees as the angle begins to deploy. As the handle clears the housing change the pull angle to as close to straight downward as possible. Apply steady downward pressure until the doors unlock and open slightly.
7. Observe the pull tester. The correct reading point must not exceed 45 lb (when the doors unlock and open slightly).
8. Open the doors completely by hand.
9. Return the manual release handle to the stowed position.
10. Grasp the doors at the window inner seal and move the doors to the closed position by hand.
11. Return the overhead emergency release handle to the NORMAL position.
    - When the manual release handle is pulled the doors must unlock and open slightly, and must be able to opened completely by hand.
    - The force to unlock and slightly open the doors, as read on the pull tester, must not exceed 45 lb.

– When the overhead emergency release handle has been returned to the NORMAL position, the doors must be closed and locked.

–

Passenger Emergency Stop System Test

To perform Passenger Emergency Stop System Test Setup proceed as follows:

1. Set the Vehicle in safety condition in accordance with MBTA Carhouse Regulations.
   – Switch OFF the Battery Circuit Breaker (CB 3Q03 – Battery Box).
2. Pull the Passenger Emergency Stop Handle. The car doors must unlock and open far enough that they can be opened by hand.
3. Close the doors, making sure the doors are completely closed and locked.
4. Attach the pull tester tool to the manual release handle.
5. Pull on the tester with an even pressure at downward angle of approximately 45 degrees as the angle begins to deploy. As the handle clears the housing change the pull angle to as close to straight downward as possible. Apply steady downward pressure until the doors unlock and open slightly.
6. Observe the pull tester. The correct reading point must not exceed 45 lb (when the doors unlock and open slightly).
7. Open the doors completely by hand.
8. Return the manual release handle to the stowed position.
9. Grasp the doors at the window inner seal and move the doors to the closed position by hand.
10. Return the overhead emergency release handle to the NORMAL position.
11. The pass criteria for this is as follows:
    – When the manual release handle is pulled the doors must unlock and open slightly, and must be able to opened completely by hand.
    – The force to unlock and slightly open the doors, as read on the pull tester, must not exceed 45 lb.
    – When the overhead emergency release handle has been returned to the NORMAL position, the doors must be closed and locked.
    –

Manual Emergency Release Mechanism Test

To perform Manual Emergency Release Mechanism Test Setup proceed as follows:

1. Set the Vehicle in safety condition in accordance with MBTA Carhouse Regulations.

– Switch OFF the Battery Circuit Breaker (CB 3Q03 – Battery Box).

2. On the door operator, move the Manual Emergency Release Lever from the normal position to the emergency position (from left, to right). The car doors must unlock and open far enough that they can be opened by hand.
3. Close the doors by hand. Return the emergency release lever to the normal position.
4. The pass criteria for this test is as follows:
   – When the manual release handle is actuated, the doors must unlock and open slightly, and must be able to opened completely by hand.
   – When the overhead emergency release handle has been returned to the NORMAL position, the doors must be completely closed and locked.
   –

Door Out-Of-Service Mechanism Test

To perform Door Out-Of-Service Mechanism Test Setup proceed as follows:

1. Set the Vehicle in safety condition in accordance with MBTA Carhouse Regulations.
   – Switch OFF the Battery Circuit Breaker (CB 3Q03 – Battery Box).
2. Actuate the door out-of-service handle. Operate it, making sure the mechanism operates smoothly, remains locked in the actuated position, and actuates the door out-of-service switch.
3. The door out-of-service lamps must be illuminated.
4. Provide a DOOR OPEN signal to the doors. The doors must not open.

Sensitive Edge Test

To perform Sensitive Edge Test Setup proceed as follows:

1. Set the Vehicle in safety condition in accordance with MBTA Carhouse Regulations.
   – Switch OFF the Battery Circuit Breaker (CB 3Q03 – Battery Box).
2. With the doors open, place the 3/4 in. rod end of the tool where the closing doors will contact the rod.
3. Cycle the doors closed, making sure that, when the doors contact the rod, they cycle open and remain open for a preset time before cycling closed again.
4. With the doors open, place the rectangular end of the tool where it will be contacted by the closing doors. The 3/8 in. dimension must be in the plane of the door movement, and the 2 in. dimension must be perpendicular to the plane of the door movement.

Cycle he doors closed, making sure that, when the doors contact the test tool, the doors cycle open, remaining open for a preset time before cycling closed again.

> **WARNING: BEFORE PERFORMING DOORS AND BRIDGEPLATE ELECTRICAL SYSTEM TEST PROCEDURE DISCONNECT ELECTRICAL POWER FROM VEHICLE BY SWITCHING OFF THE BATTERY CB (3Q03).**

Crew Switch Operational Test

> **NOTE: CONDUCT THESE CHECKS AFTER DOOR SYSTEM HAS PASSED THE TESTING IN PARA 4-2.i.**

To Test each Crew Switch proceed as follows:

1. Set the Vehicle in safety condition in accordance with MBTA Carhouse Regulations.
   - Switch OFF the Battery Circuit Breaker (CB 3Q03 – Battery Box) and post the CB shutoff with "OUT OF SERVICE" placard.
2. Insert the crew key into the switch. For the exterior switch, this requires raising the spring loaded door to gain access.
3. With power to the door operator, turn and hold the key clockwise to the OPEN (marked O) position. The door must open.
4. Turn ad hold the key clockwise to the BRIDGEPLATE DEPLOY position (marked BP). The bridgeplate must deploy.
5. Release the key. The key must return to the centered position, and no bridgeplate or door movement is allowed.
6. Turn and hold the key counterclockwise to the CLOSE position (marked C). The bridgeplate must retract, and then the doors must close.

Passenger Pushbutton Test

To Test each Crew Switch proceed as follows:

1. Set the Vehicle in safety condition in accordance with MBTA Carhouse Regulations.
   - Switch OFF the Battery Circuit Breaker (CB 3Q03 – Battery Box) and post the CB shutoff with "OUT OF SERVICE" placard.
2. Press the passenger pushbutton. The green LEDs on the passenger pushbutton must illuminate.
3. As the doors open and the bridgeplate deploys and then retracts, the green LEDs must flash.

4. Place the bridgeplate out-of-service switch on the door operator to BYPASS. The red LEDs on the passenger pushbutton must illuminate.

4-2.1 Door Module Assembly Equipment

4-2.1.a Description & Operation

The Door Module Assembly Equipment consists in the following main components:

- Door Module Frame Assembly;
- Door Operator Assembly;
- Manual Emergency Release Mechanism;
- Door Out-Of-Service Mechanism;
- Door Operator to Door Linkage and Support Components;
- Door Sensitive Edge Assembly;
- Door Sealing System;
- Door Speed Control;

4-2.1.b Specific Safety Precautions

WARNING:	**BEFORE PERFORMING DOOR MODULE ASSEMBLY EQUIPMENT MAINTENANCE PROCEDURES DISCONNECT ELECTRICAL POWER FROM VEHICLE BY SWITCHING OFF THE BATTERY CB (3Q03).**

4-2.1.c Fault/Isolation

The Door Module Assembly Equipment Fault Isolation, is included in Doors Fault Isolation procedure, refer to para 4-2.c.

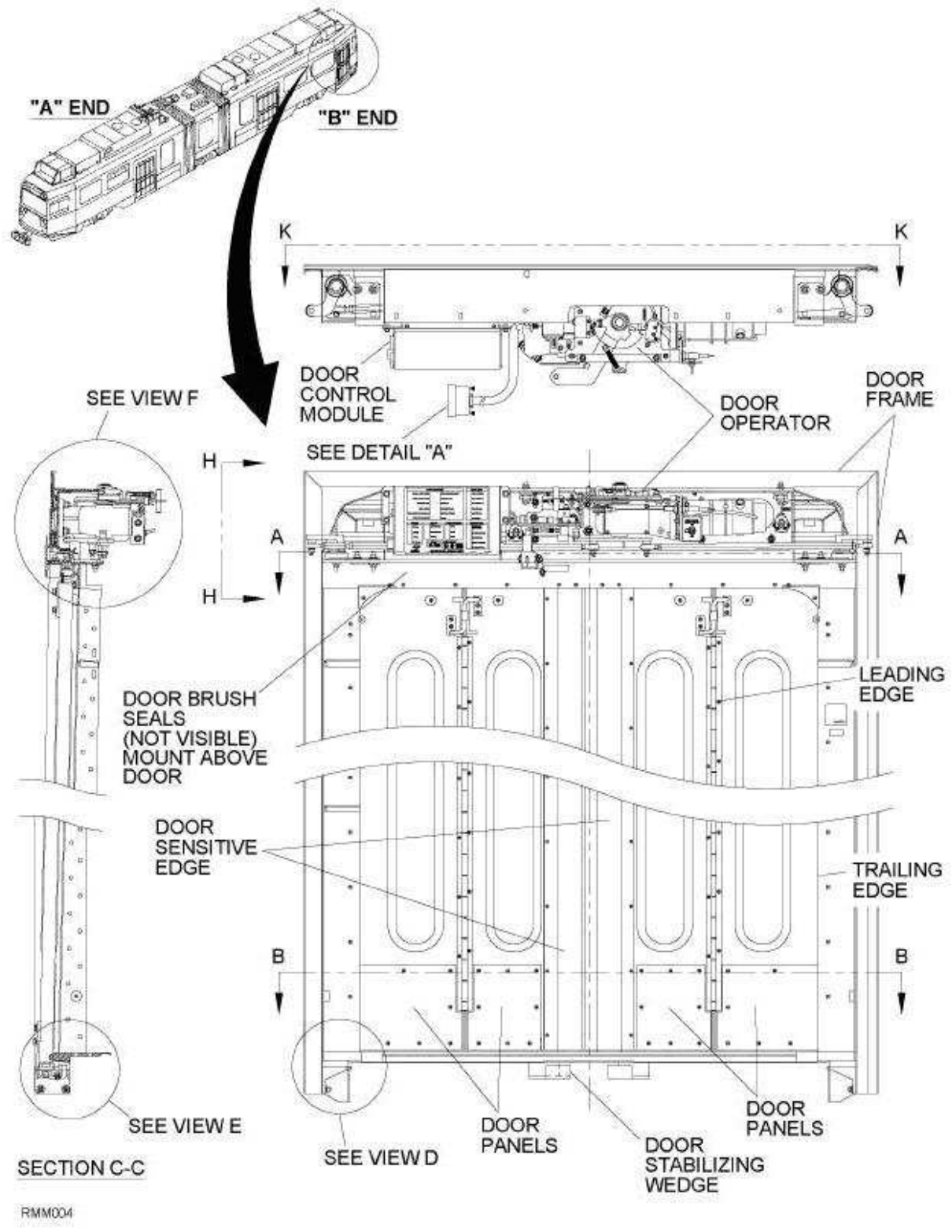

Figure 4-2.3 Door Module Assembly Equipment (Sheet 1 of 3)

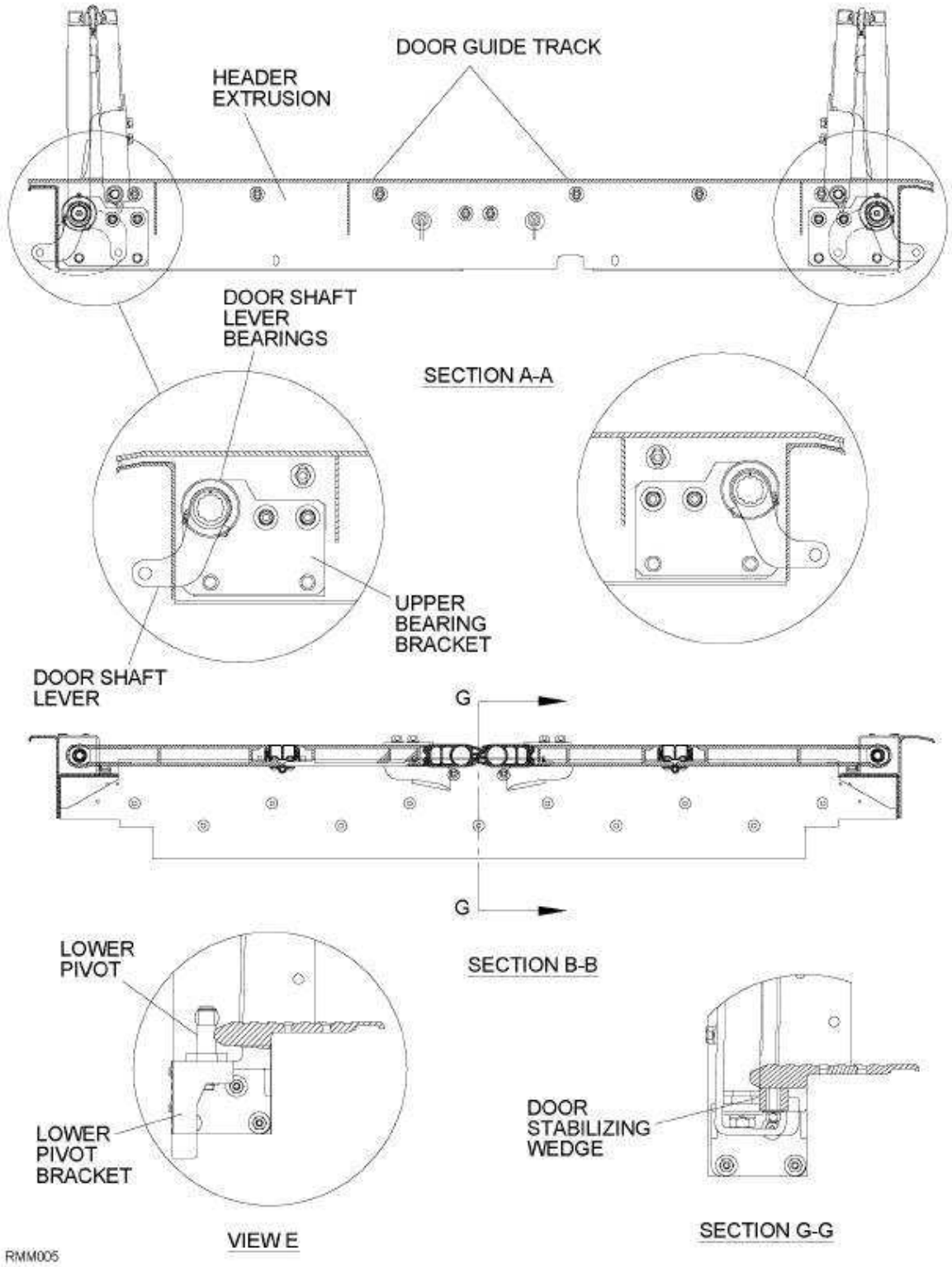

Figure 4-2.3 Door Module Assembly Equipment (Sheet 2 of 3)

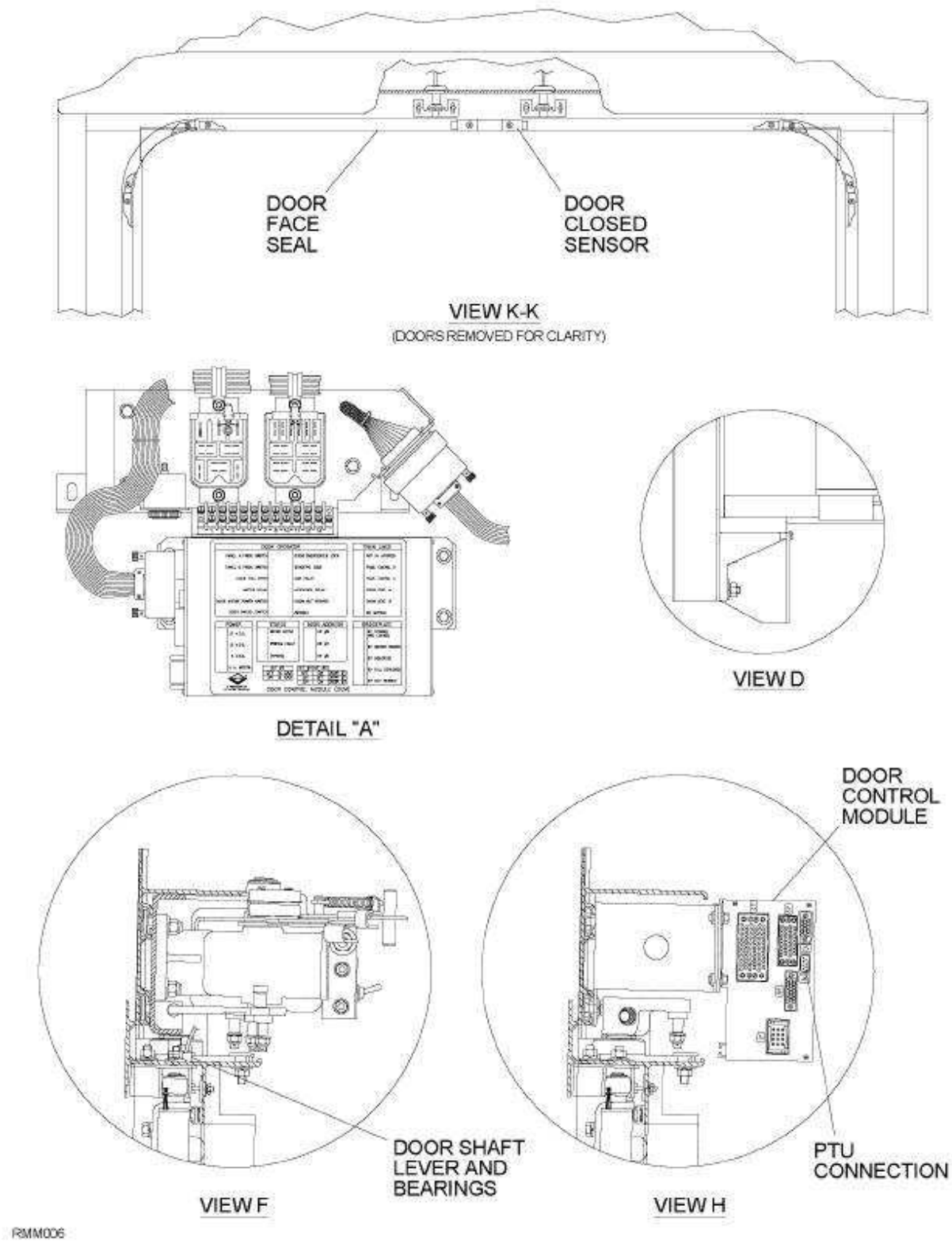

Figure 4-2.3 Door Module Assembly Equipment (Sheet 3 of 3)

4-2.1.d Disassembly

- **Reference Information.**
  1. Tools / Equipment.
     – MBTA Overhaul Standard Tools Kit.
  2. Material (Not Applicable).

Since the Door Module assembly equipment System consists of separate items, the disassembly procedure is described in the para(s) related to each item, as shown in Table 4-2.14.

Table 4-2.14 Door System Components – Disassembly

Components	Para(s)
Door Module Frame Assembly	4-2.1.2.d
Door Operator Assembly	4-2.1.3.d
Manual Emergency Release Mechanism	4-2.1.4.d
Door Out-Of-Service Mechanism	4-2.1.5.d
Door Operator to Door Linkage and Support Components	4-2.1.6.d
Door Sensitive Edge Assembly	4-2.1.7.d
Door Sealing System	4-2.1.8.d
Door Speed Control	4-2.1.9.d

4-2.1.e Cleaning/Painting

- **Reference Information.**
  1. Tools / Equipment.
     – MBTA approved Cleaning Tools / Equipment (commercial).
  2. Material.
     – MBTA approved Cleaning Products (commercial) (Refer to Section 1 Table 1-9).

Since the Door Module assembly equipment System consists of separate items, the Cleaning procedure is described in the para(s) related to each item, as shown in Table 4-2.15. For Vehicle Interior Cleaning Procedure refer to Section 2 of this Manual

Table 4-2.15 Door System Components – Cleaning/Painting

Components	Para(s)
Door Module Frame Assembly	4-2.1.2.e
Door Operator Assembly	4-2.1.3.e
Manual Emergency Release Mechanism	4-2.1.4.e
Door Out-Of-Service Mechanism	4-2.1.5.e
Door Operator to Door Linkage and Support Components	4-2.1.6.e
Door Sensitive Edge Assembly	4-2.1.7.e
Door Sealing System	4-2.1.8.e
Door Speed Control	4-2.1.9.e

4-2.1.f Inspection

- **Reference Information.**
  1. Tools / Equipment (Not Applicable).
     – MBTA Carhouse Standard Tools Kit.
  2. Material (Not Applicable).

Since the Door Module assembly equipment System consists of separate items, the Inspection procedure is described in the para(s) related to each item, as shown in Table 4-2.16.

Table 4-2.16 Door System Components – Inspection

Components	Para(s)
Door Module Frame Assembly	4-2.1.2.f
Door Operator Assembly	4-2.1.3.f
Manual Emergency Release Mechanism	4-2.1.4.f
Door Out-Of-Service Mechanism	4-2.1.5.f
Door Operator to Door Linkage and Support Components	4-2.1.6.f
Door Sensitive Edge Assembly	4-2.1.7.f
Door Sealing System	4-2.1.8.f
Door Speed Control	4-2.1.9.f

4-2.1.g Repair (Not Applicable)

4-2.1.h Reassembly

- **Reference Information.**
  1. Tools / Equipment.
     – MBTA Overhaul Standard Tools Kit.
  2. Material (Not Applicable).

Since the Door Module assembly equipment System consists of separate items, the Reassembly procedure is described in the para(s) related to each item, as shown in Table 4-2.17.

Table 4-2.17 Door System Components – Reassembly procedure

Components	Para(s)
Door Module Frame Assembly	4-2.1.2.h
Door Operator Assembly	4-2.1.3.h
Manual Emergency Release Mechanism	4-2.1.4.h
Door Out-Of-Service Mechanism	4-2.1.5.h
Door Operator to Door Linkage and Support Components	4-2.1.6.h
Door Sensitive Edge Assembly	4-2.1.7.h
Door Sealing System	4-2.1.8.h
Door Speed Control	4-2.1.9.h

4-2.1.i Adjustment/Test

a) Adjustment

Since the Door Module assembly equipment System consists of separate items, the Adjustment procedure is described in the para(s) related to each item, as shown in Table 4-2.18

Table 4-2.18 Door System Components – Adjustment

Components	Para(s)
Door Module Frame Assembly	4-2.1.2.i
Door Operator Assembly	4-2.1.3.i
Manual Emergency Release Mechanism	4-2.1.4.i
Door Out-Of-Service Mechanism	4-2.1.5.i
Door Operator to Door Linkage and Support Components	4-2.1.6.i
Door Sensitive Edge Assembly	4-2.1.7.i
Door Sealing System	4-2.1.8.i
Door Speed Control	4-2.1.9.i

4-2.1.2 Door Module Frame Assembly

4-2.1.2.a Description & Operation

Two door module frame sizes (Refer to Figure 4-2.3) are supplied to accommodate both the high floor (A1 and B1) and low floor (A2, A3, B2 and B3) structural openings. The door module frames are made of aluminum, and consist of a header extrusion (lintel) welded to 2 side post extrusions, and a removable threshold that is bolted to the sideposts. The following main door components are installed on the door module frame assembly:

- Door operator assembly
- Door panel assemblies
- Door shaft lever bearings
- Lower pivots
- Door guide tracks
- Lower door stabilizing wedges
- Door sensitive edges
- Door face seals
- Upper brush seal.

The outer perimeter of the door module frame overlaps the outside surface of the vehicle portal opening. The inboard perimeter of the door module frame is fastened mechanically to the internal structure of the opening.

4-2.1.2.b Specific Safety & Precautions

For Specific Safety Precautions refer 4-2.b

4-2.1.2.c Fault Isolation

For Fault Isolation refer to section 4-2.c

4-2.1.2.d Disassembly

- **Reference Information.**
  1. Tools / Equipment.
     – MBTA Overhaul Standard Tools Kit.
  2. Material (Not Applicable).
- **Procedure**

Door Module Frame Assembly

The door frame cannot be removed from the car nor reinstalled on the car without the removal of the following components. The following components are removed and reinstalled separately (not necessarily in this order):

- Right-hand and left-hand doors
- Door control module and door operator
- Crew switches
- Pushbutton assembly
- Manual release assembly
- Cable assembly
- Bridgeplate assembly
- Bearing plate assemblies
- Door shaft lever assemblies
- Connecting rod assemblies
- Roller channel assemblies
- Bottom pivot assemblies

The right-hand and left-hand door panels must be removed before the door frame can be removed. After the door panels have been removed, the door frame can be removed as an assembly. Every door frame is matched to the car during installation. Each must be reinstalled in the same opening from which it was removed.

WARNING:	**THE DOOR MODULE FRAME IS A WELDED ASSEMBLY THAT WEIGHS APPROXIMATELY 75 POUNDS AND IS AWKWARD TO HANDLE. MAKE SURE ASSISTANCE IS AVAILABLE BEFORE REMOVING THE ATTACHING FASTENERS FROM THE DOOR MODULE FRAME.**

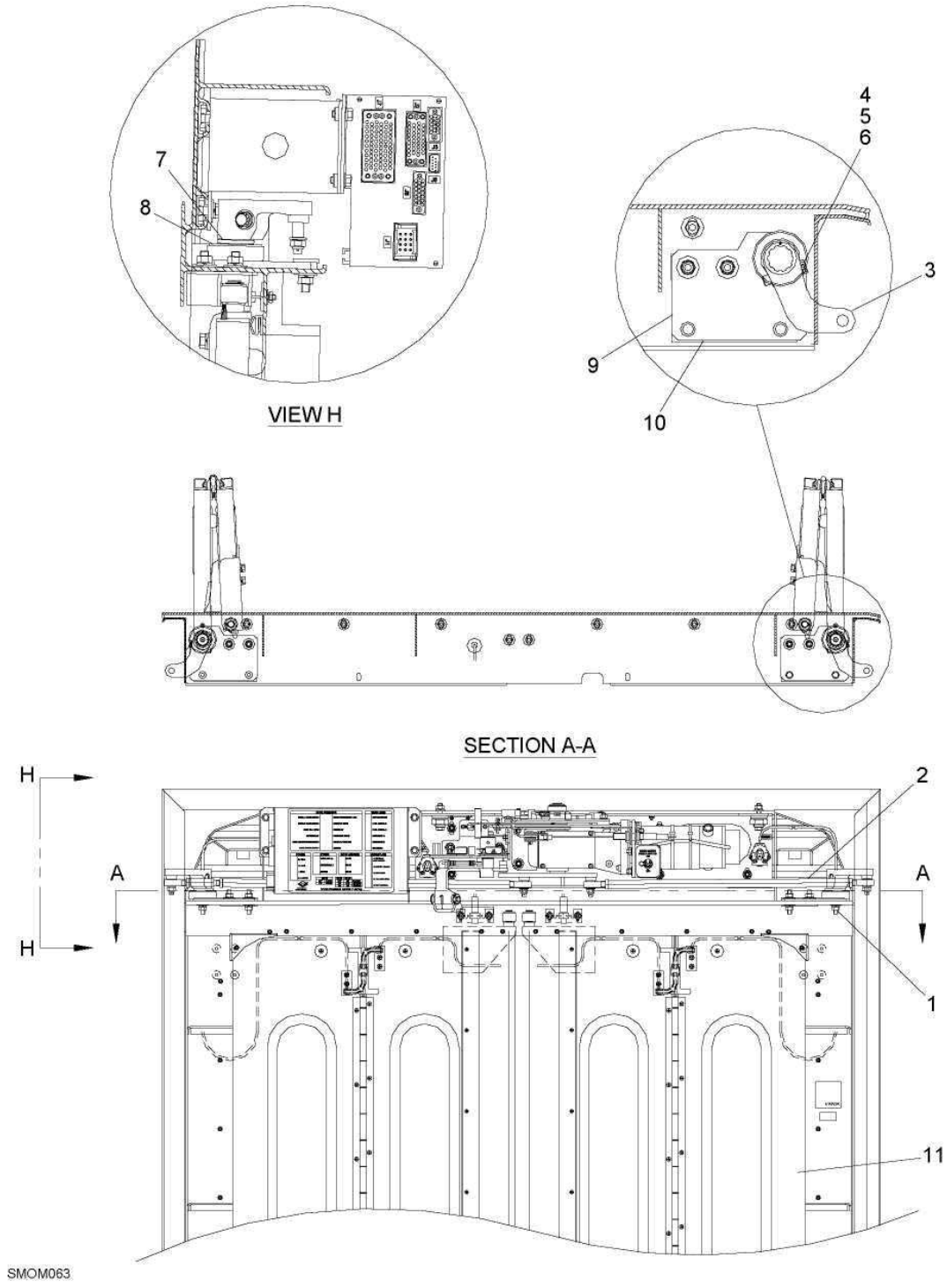

Figure 4-2.3 Removing the Door Panel

ITEM NO.	PART NAME	QTY	ITEM NO.	PART NAME	QTY
	Door Panel Assembly	Ref			
1	Sensitive Edge Tubing	Ref	7	Spacer	1
2	Operating Rod	1	8	Bearing Assembly	1
3	Lever Assembly	1	9	Bearing Plate	1
4	Screw	1	10	Mounting Plate	1
5	Locking Wedge	1	11	Door Panel	1

(A) Right Hand High Floor Door Assembly

a) Removal for Heavy Maintenance

Refer to Figure 4-2.3. for Removing the Door Panels. Remove the right-hand door panels as described below.

WARNING: THE DOOR PANELS ARE HEAVY AND AWKWARD TO LIFT. TO AVOID INJURY, HAVE ASSISTANCE LIFTING THE DOOR PANELS FROM THE MOUNTINGS.

1. Disconnect the sensitive edge tubing (1) from the sensitive edge switch on the door operator.
2. Disconnect the operating rod (2) from the lever assembly (3).
3. Back out the screw (4) until the locking wedges (5 and 6) are loosened enough to remove the lever assembly (3).
4. Remove the spacer (7) and bearing assembly (8).
5. Remove the attaching hardware, and remove the bearing plate (9) and mounting plate (10).
6. Disengage the roller on the roller bracket from the roller channel on the car body, and lift the door panels (11) from the lower pivot socket.

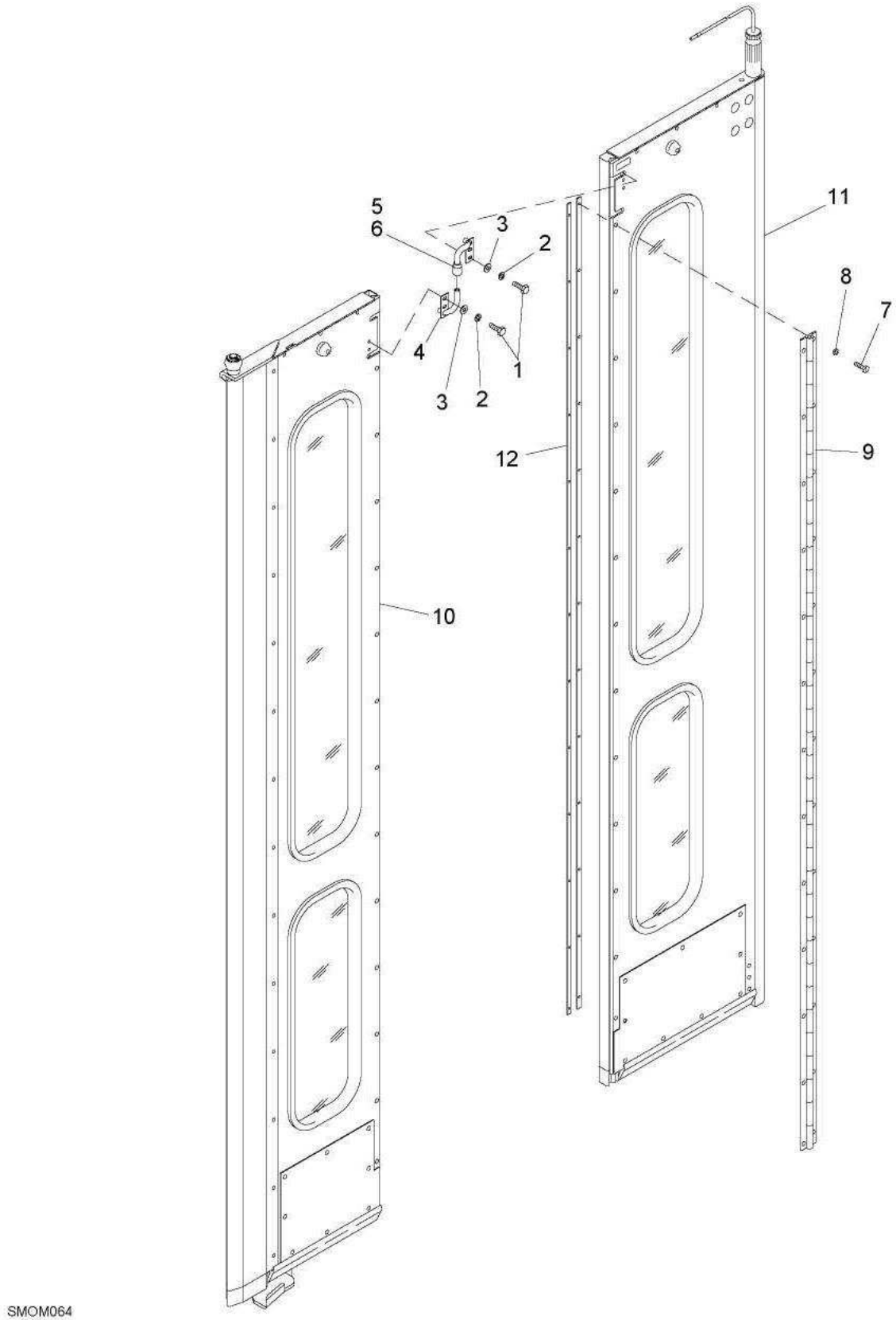

Figure 4-2.4. Separating the Door Panels (Step 1)

ITEM NO.	PART NAME	QTY	ITEM NO.	PART NAME	QTY
	Door Assembly				
1	Pan Head Screw	4	7	Pan Head Screw	26
2	Lockwasher	4	8	Lockwasher	26
3	Plain Washer	4	9	Hinge	1
4	Transfer Tube	1	10	Door center panel	1
5	Transfer Tube	1	11	Door hinge panel	1
6	Alignment Sleeve	1	12	Tapping Strip	2

General Disassembly Instructions

During scheduled overhauls, remove and discard the following parts and replace them with new:

- All attaching parts
- All retaining rings
- Door seals
- Window seals
- Wear components

b) Right Hand High Floor Door Disassembly

i) Separate Center Door Panel

1. Refer to Figure 4-2.4 Separating the Door Panels (Step 1). Separate the center door panel from the hinged door panel as described below.
2. Remove four screws (1), four lockwashers (2), and four plain washers (3). This frees the guide assembly transfer tubes (4 and 5) and the integral alignment sleeve (6).
3. Remove the sensitive edge tubing from the transfer tubes (4 and 5).
4. Remove 13 screws (7) and 13 lockwashers (8) from the center panel side of the center hinge (9) and separate the door center panel (10) from the hinge panel (11). This frees the door center panel and one tapping strip (12).
5. Remove 13 screws (7) and 13 lockwashers (8) from the hinge panel side of the door center hinge (9) and separate the door center hinge from the hinge panel (11). This frees the remaining tapping strip (12).

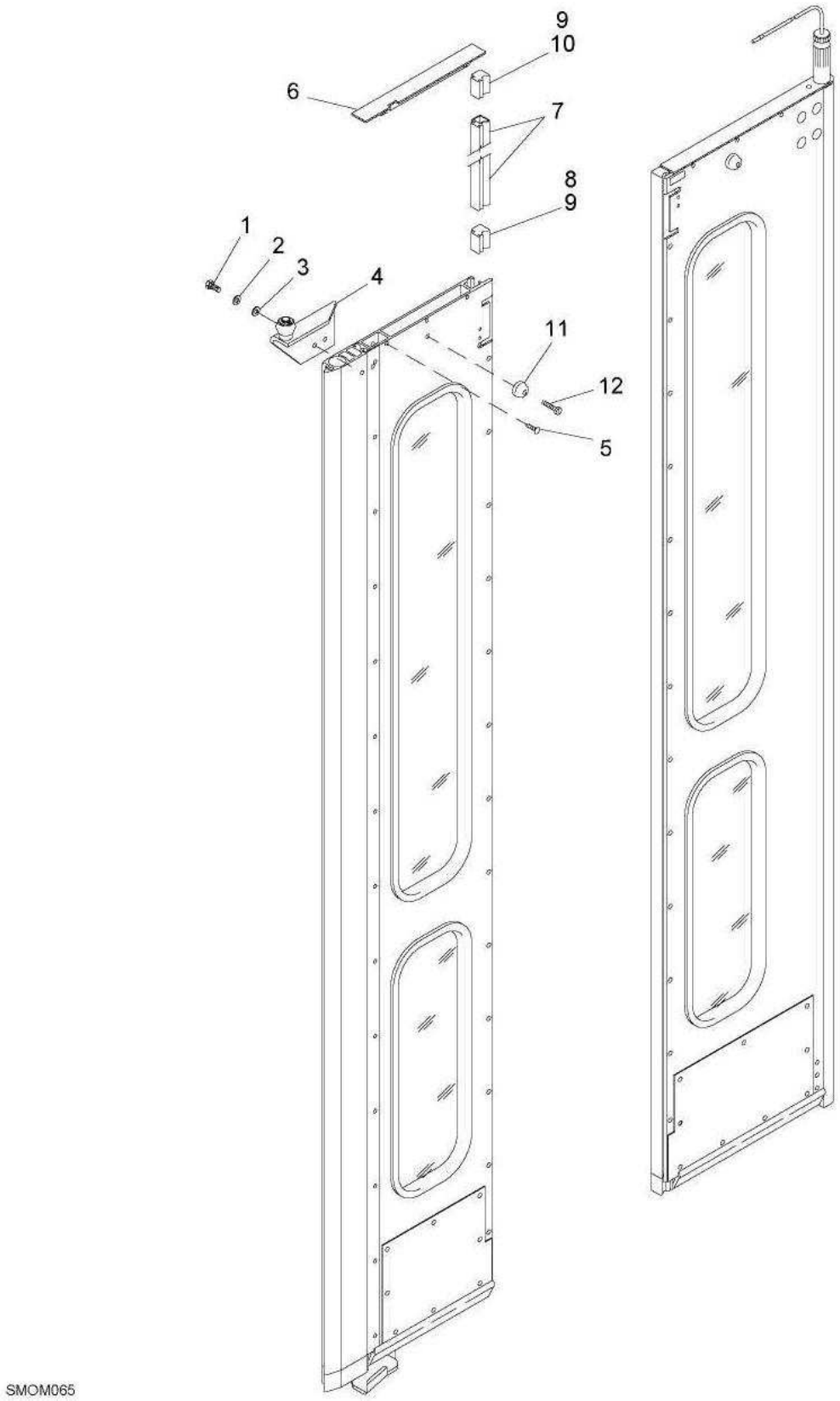

Figure 4-2.5. Door Center Panel Upper Edge Components (Step 2)

ITEM NO.	PART NAME	QTY	ITEM NO.	PART NAME	QTY
	Door Assembly	Ref			
1	Hex Head Screw	2	7	Biparting Seal	1
2	Lockwasher	2	8	Seal Plug	1
3	Plain Washer	2	9	Adhesive	AR
4	Roller Bracket Assembly	1	10	Door Frame Cap	1
5	Flat Head Screw	3	11	Pad Stop	1
6	Panel Cap	1	12	Rivet	1

ii) Door Center Panel Upper Edge Components

Refer to Figure 4-2.5 Door Center Panel Upper Edge Components (Step 2). Remove the door center panel upper edge components as described below.

1. Remove two screws (1), two lockwashers (2), and two plain washers (3), and remove the roller bracket assembly (4).
2. Remove three flat head recessed screws (5), and remove the panel cap (6).
3. Slide the biparting seal (7) from its track in the edge of the door panel. This biparting seal includes the seal plug (8) and the doorframe cap (10), which are bonded to the biparting seal (7) at assembly using the adhesive (9).
4. Remove the pad stop (11). Drill the head of the rivet (12) to a thin shell, pull the rivet shell from the door countersink and press the rivet into the door. Remove the rivet from the door interior

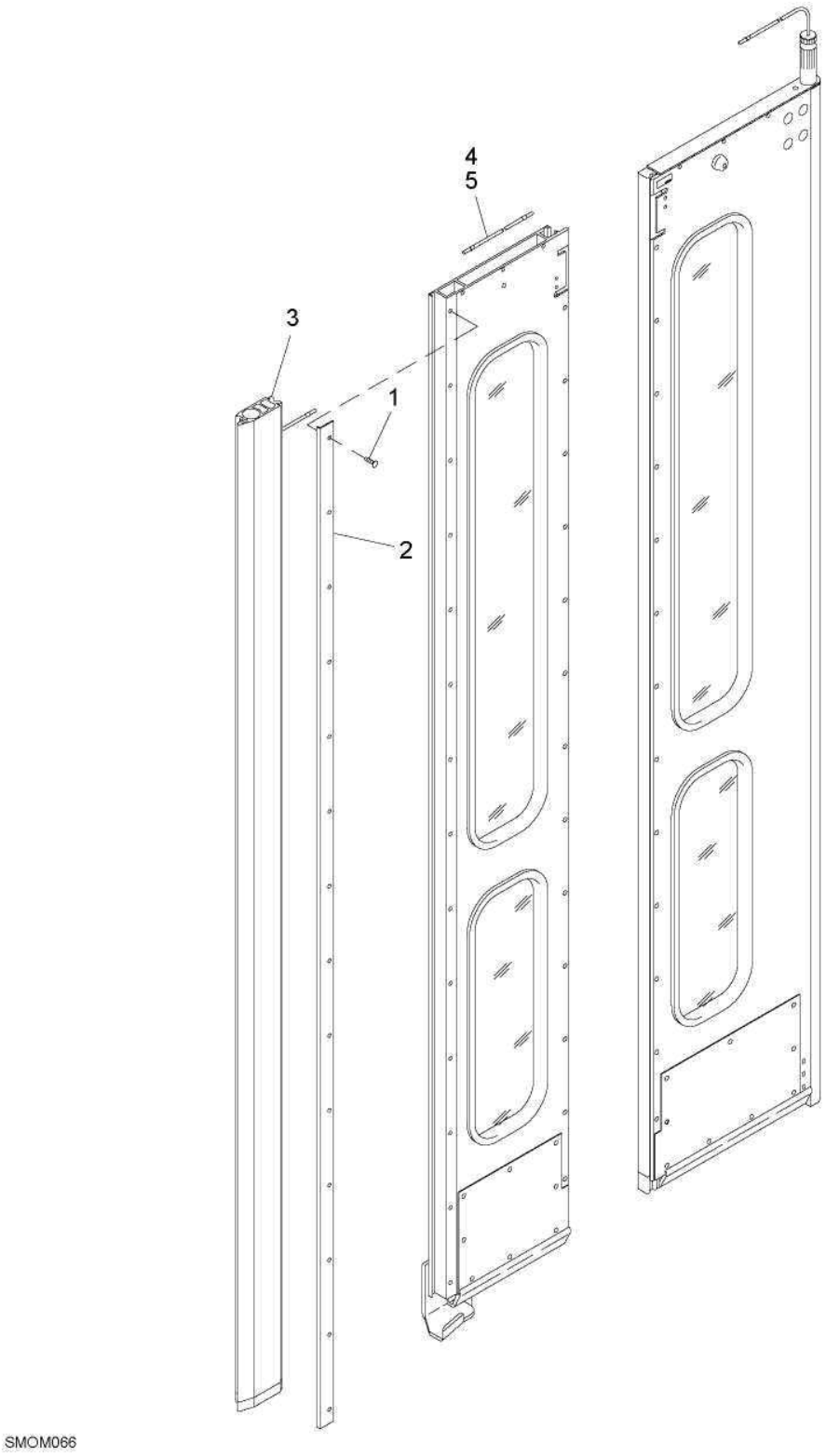

Figure 4-2.6. Door Center Panel Sensitive Edge Assembly (Step 3)

ITEM NO.	PART NAME	QTY	ITEM NO.	PART NAME	QTY
	Door Assembly	Ref			
1	Flat Head Screw	14	4	Tubing	AR
2	Edge Retainer	1	5	Connector	2
3	Sensitive Edge Assembly	1			

iii) Door Center Panel Sensitive Edge

Refer to Figure 4-2.6 Door Center Panel Sensitive Edge Assembly (Step 3). Remove the door center panel sensitive edge and related components as described below.

1. Remove 14 screws (1) from the edge retainer (2). Remove the edge retainer.
2. Pull the door sensitive edge (3) from the edge of the door panel.
3. Disconnect the tubing (4) and connector (5) from the sensitive edge.
4. Remove the tubing section and connector from the top interior of the door panel.

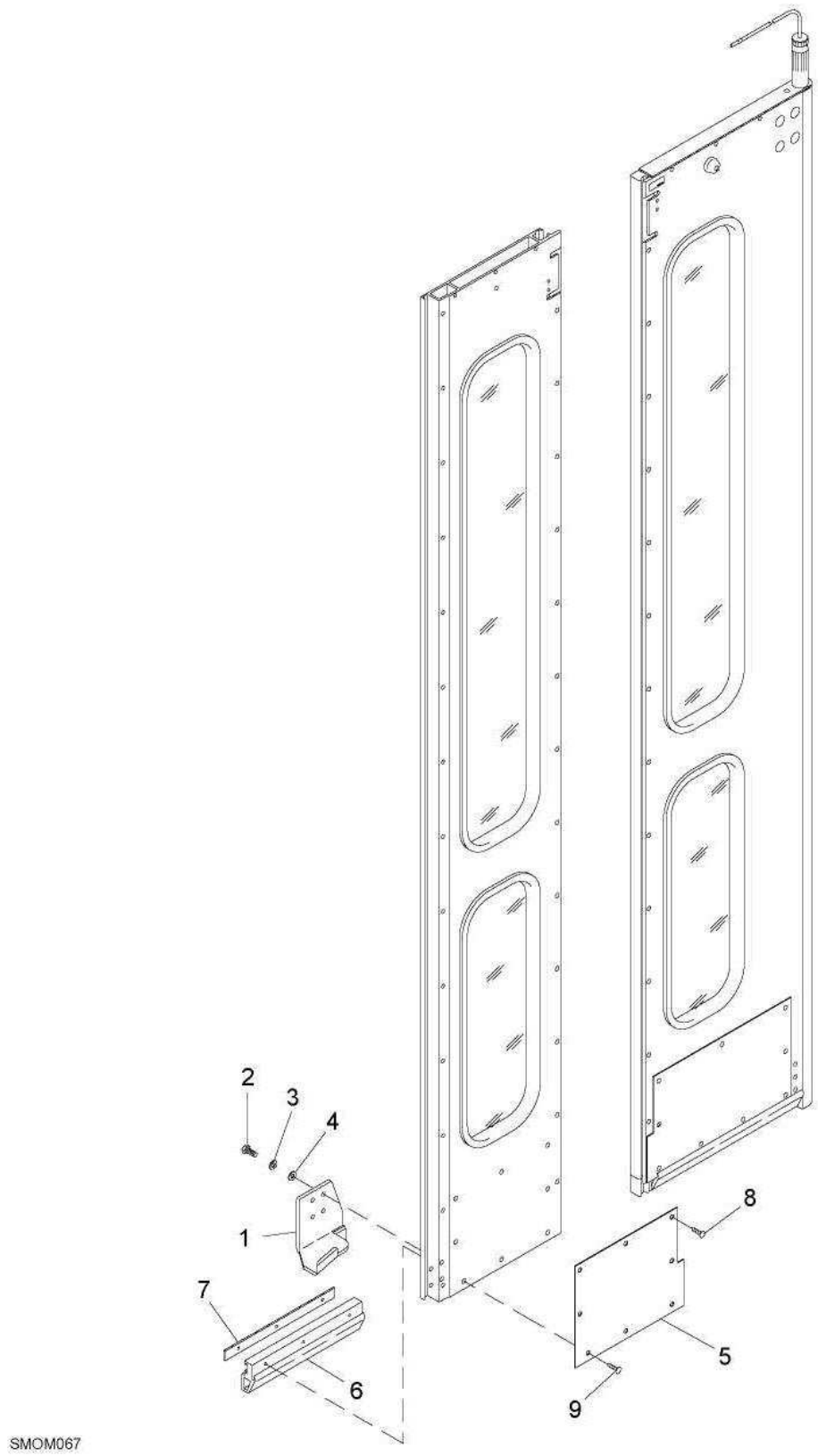

Figure 4-2.7 Bottom Edge Components (Step 4)

ITEM NO.	PART NAME	QTY	ITEM NO.	PART NAME	QTY
	Door Assembly	Ref			
1	Guide Bracket, RH	1	6	Bottom Seal	1
2	Hex Head Cap Screw	4	7	Tapping Pad	1
3	Lockwasher	4	8	Screw	5
4	Plain Washer	4	9	Screw	3
5	Kick Plate, LH	1			

iv) Door Bottom Edge

Refer to Figure 4-2.7 Bottom Edge Components (Step 4). Remove the door bottom edge components as described below.

1. Remove the guide bracket (1) by removing four screws (2), lockwashers (3), and plain washers (4). Discard the screws and washers.
2. Remove the left-hand kick plate (5), the bottom seal (6), and the tapping pad (7) by removing five screws (8) and three screws (9). Discard the screws.

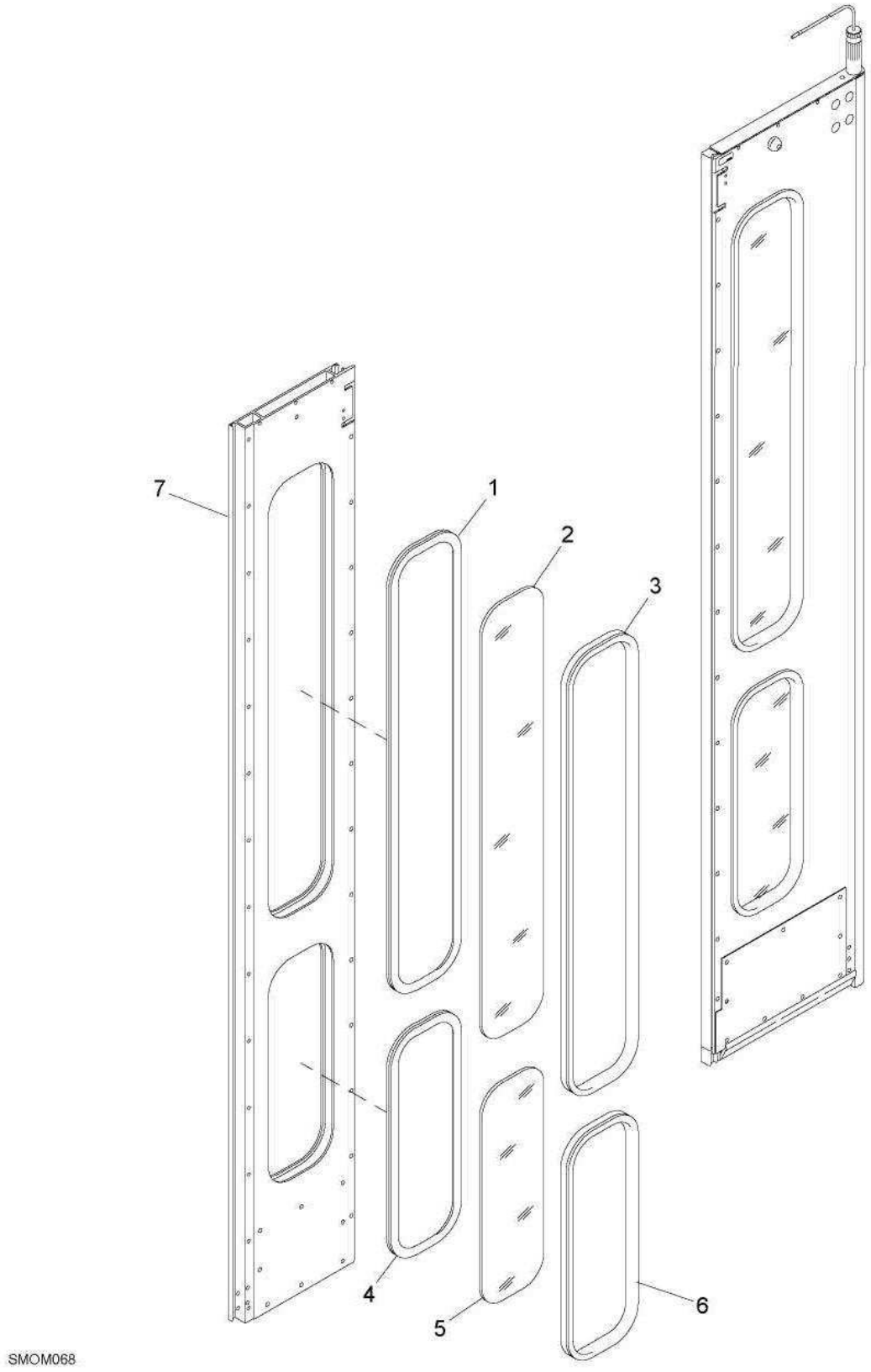

Figure 4-2.8 Center Door Panel Windows (Step 5)

ITEM NO.	PART NAME	QTY	ITEM NO.	PART NAME	QTY
	Door Assembly	Ref			
1	Outside Window Seal, Upper	1	5	Window Glass, Lower	1
2	Window Glass, Upper	1	6	Inside Window Seal, Lower	1
3	Inside Window Seal, Upper	1	7	Door Center Panel	1
4	Outside Window Seal, Lower	1			

v) Windows

Refer to Figure 4-2.8 Center Door Panel Windows (Step 5). Remove the windows as described below.

WARNING: BE EXTREMELY CAREFUL WHILE REMOVING THE WINDOW GLASS. ALTHOUGH THE GLASS IS SAFETY GLASS, THERE IS STILL POTENTIAL FOR INJURY IF THE GLASS IS BROKEN

1. Remove the upper window glass using a CRL Tapered End Window Stick Setting Tool (C.R. Laurence P/N CRL216). Working from the outside of the door, insert the tool between the outside window seal (1) and the door skin at the top of the door. Grasp the window seal, and pull it downward to remove it.
2. Using the - Nylon Tool (REFER MCMASTER CARR PART NO. 6036A21 OR EQUIVALENT), tip the glass (2) free at one side and remove it.
3. If the inside window seal is not damaged, do not remove it. If the inside seal (3) is damaged or dislodges while removing the upper window glass (2), grasp the inside seal and pull the seal from the door skin.
4. Remove the lower window glass using the pointed nylon tool. Working from the outside of the door, insert the tool between the outside window seal (4) and the door skin at the top of the door. Grasp the window seal, and pull it downward to remove it.
5. Using the nylon tool, tip the glass (5) free at one side and remove it.
6. If the inside window seal is not damaged, do not remove it. If the inside seal (6) is damaged or dislodges while removing the lower window glass (5), grasp the inside seal and pull the seal from the door skin. This completes removal of all components from the center door panel (7).

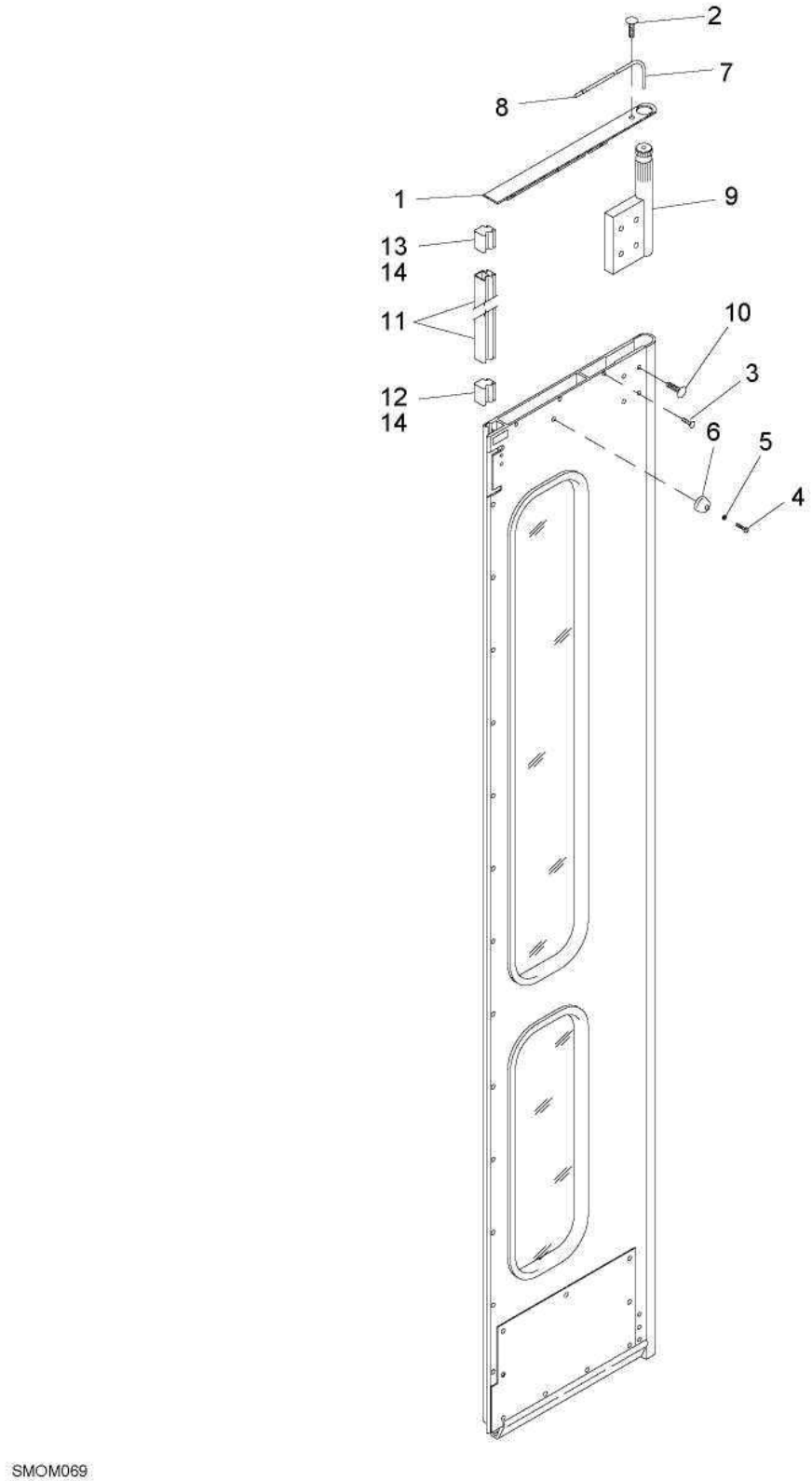

Figure 4-2.9 Door Top Edge Components (Step 6)

ITEM NO.	PART NAME	QTY	ITEM NO.	PART NAME	QTY
	Door Assembly	Ref			
1	Panel Cap	1	8	Connecting Fitting	1
2	Flat Head Screw	1	9	Stub Shaft and Bracket	1
3	Flat Head Screw	3	10	Flat Head Screw	4
4	Pan Head Screw	1	11	Biparting Seal	1
5	Lockwasher	1	12	Plug	1
6	Bumper	1	13	Door Frame Cap	1
7	Tubing	AR	14	Adhesive	AR

vi) Door Top Edge Components

Refer to Figure 4-2.9 Door Top Edge Components (Step 6). Remove the door top edge components as described below.

1. Remove the panel cap (1) by removing one screw (2) and three screws (3). Discard the screws.
2. Remove the bumper (6) by removing the screw (4) and lockwasher (5). Discard the screw, washer, and bumper.
3. Remove the connector fitting (8) and the tubing (7). Discard these parts.
4. Remove and discard four screws (10). Slide the stub shaft and bracket (9) from the top of the door.
5. Slide the biparting seal (11) from the door edge. The plug (12) and door frame cap (13) have been bonded to the biparting seal with adhesive (14).

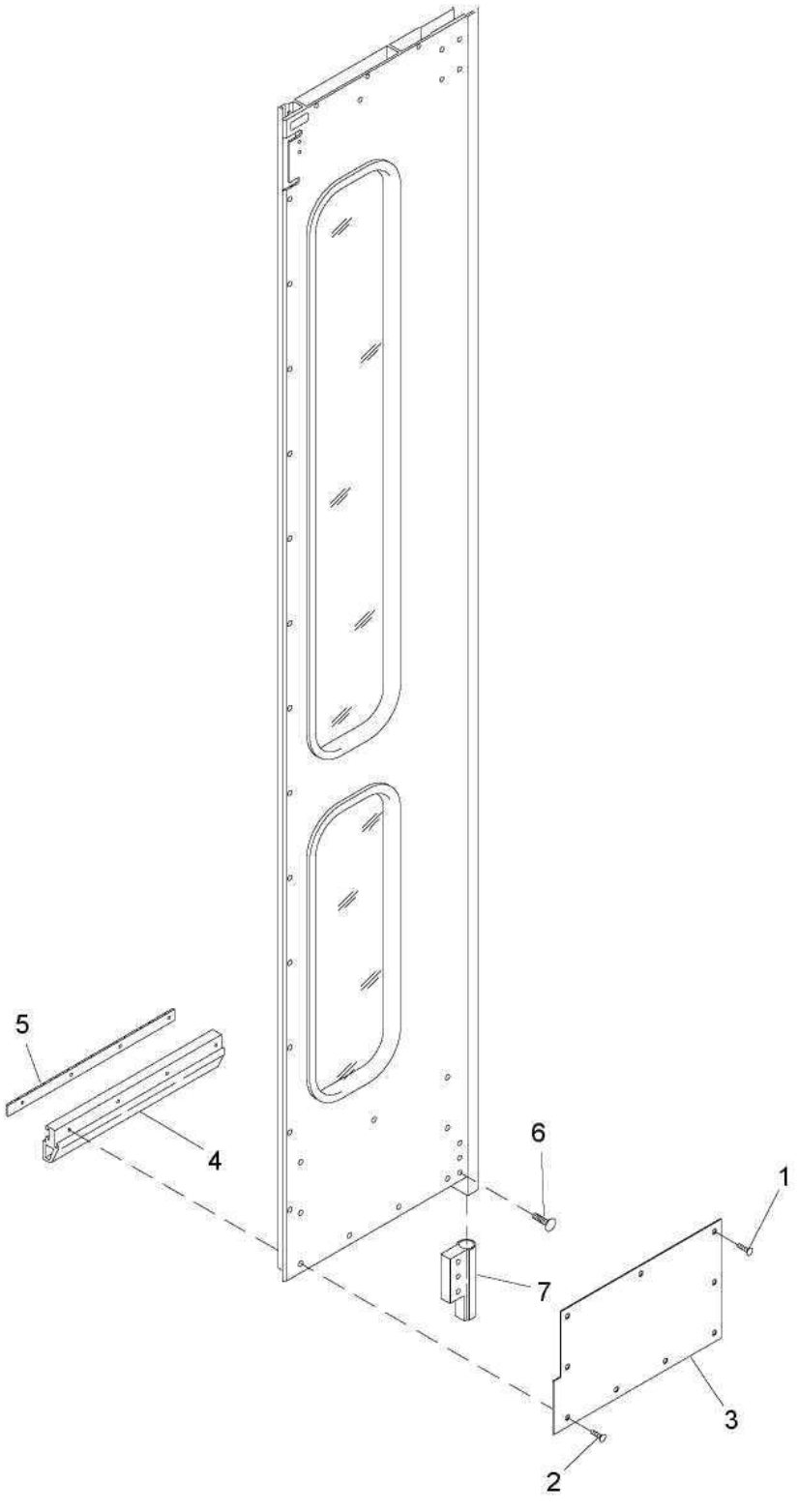

Figure 4-2.10 Bottom Edge Components (Step 7)

ITEM NO.	PART NAME	QTY	ITEM NO.	PART NAME	QTY
	Door Assembly	Ref			
1	Screw	5	5	Tapping Pad	1
2	Screw	4	6	Screw	3
3	Kick Panel	1	7	Pivot Bracket	1
4	Bottom Seal	1			

vii) Door Bottom Edge Components

Refer to Figure 4-2.10 Bottom Edge Components (Step 7). Remove the door bottom edge components as described below.

1. Remove and discard five screws (1) and four screws (2) and remove the kick panel (3). This frees the bottom seal (4) and tapping pad (5).
2. Remove and discard bottom seal (4).
3. Remove and discard three screws (6).
4. Slide the pivot bracket (7) from the door bottom edge.

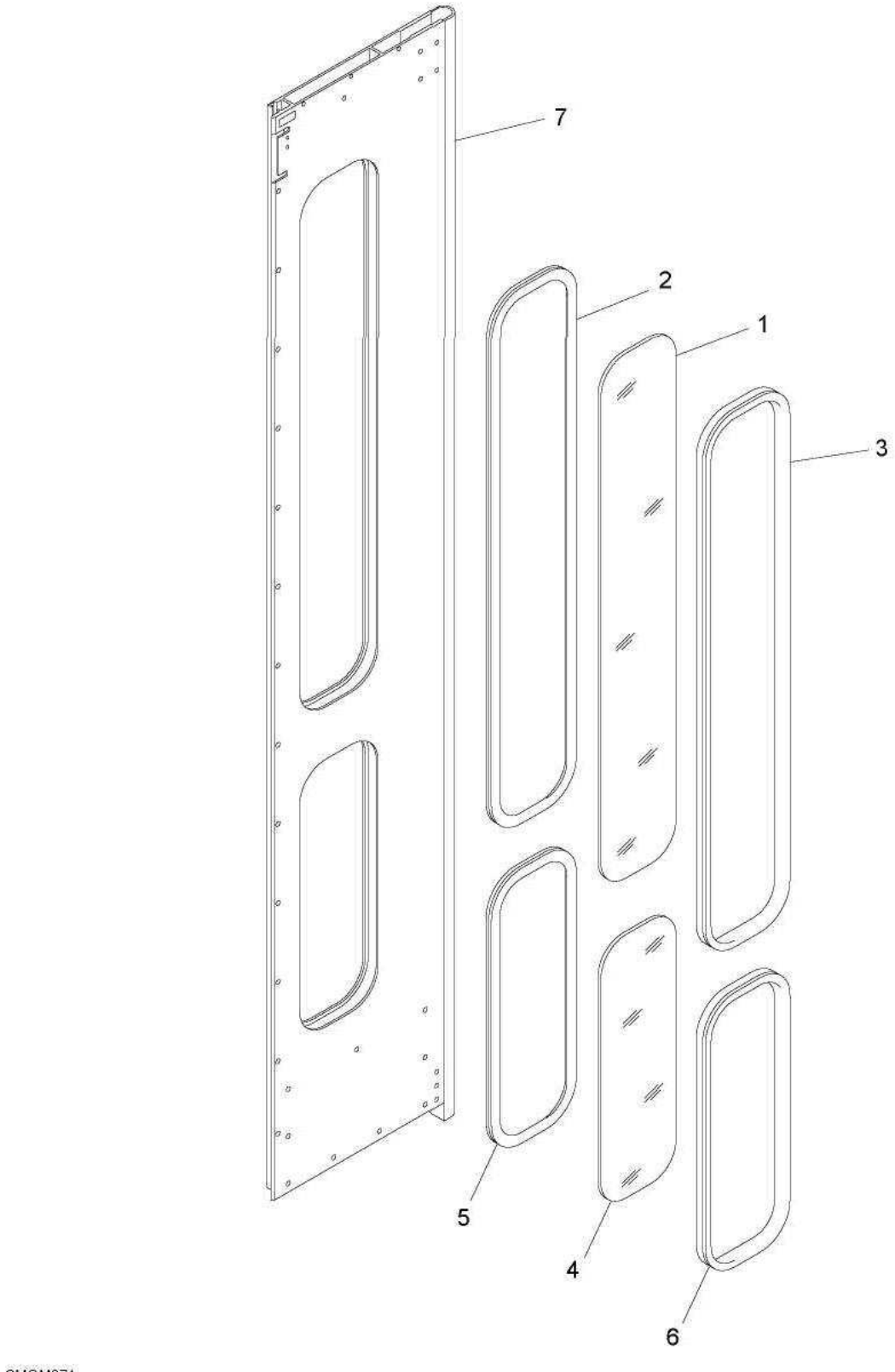

Figure 4-2.11. Hinge Door Windows (Step 8)

ITEM NO.	PART NAME	QTY	ITEM NO.	PART NAME	QTY
	Door Assembly	Ref			
1	Window Glass, Upper	1	5	Outside Window Seal, Lower	1
2	Outside Window Seal, Upper	1	6	Inside Window Seal, Lower	1
3	Inside Window Seal, Upper	1	7	Hinge Door Panel	1
4	Window Glass, Lower	1			

WARNING: BE EXTREMELY CAREFUL WHILE REMOVING THE WINDOW GLASS. ALTHOUGH THE GLASS IS SAFETY GLASS, THERE IS STILL POTENTIAL FOR INJURY IF THE GLASS IS BROKEN

viii) Hinge Door Windows

Refer to Figure 4-2.11. Hinge Door Windows (Step 8). Remove the windows as described below.

1. Remove the upper window glass (1) using a CRL Tapered End Window Stick Setting Tool (C.R. Laurence P/N CRL216).. Working from the outside of the door, insert the tool between the outside window seal (2) and the door skin at the top of the door. Grasp the window seal, and pull it downward to remove it.
2. Using the nylon tool, tip the glass (1) free at one side and remove it.
3. If the inside window seal (3) is not damaged, do not remove it. If it is damaged or dislodges while removing the upper window glass (1), grasp the inside seal and pull the seal from the door skin.
4. Remove the lower window glass (4) using the pointed nylon tool. Working from the outside of the door, insert the tool between the outside window seal (5) and the door skin at the top of the door. Grasp the window seal, and pull it downward to remove it.
5. Using the nylon tool, tip the glass (4) free at one side and remove it.
6. If the inside window seal (6) is not damaged, do not remove it. If it is damaged or dislodges while removing the lower window glass (4), grasp the inside seal and pull the seal from the door skin. This completes removal of all components from the hinge door panel (7).

(B) Left Hand High Floor Door Assembly

The left-hand high floor door assembly is the mirror image of the right-hand high floor door assembly. Heavy maintenance of the left-hand high floor door assembly is identical to heavy maintenance for the right-hand high floor door assembly .Refer section 4-2.1.2.d (A)

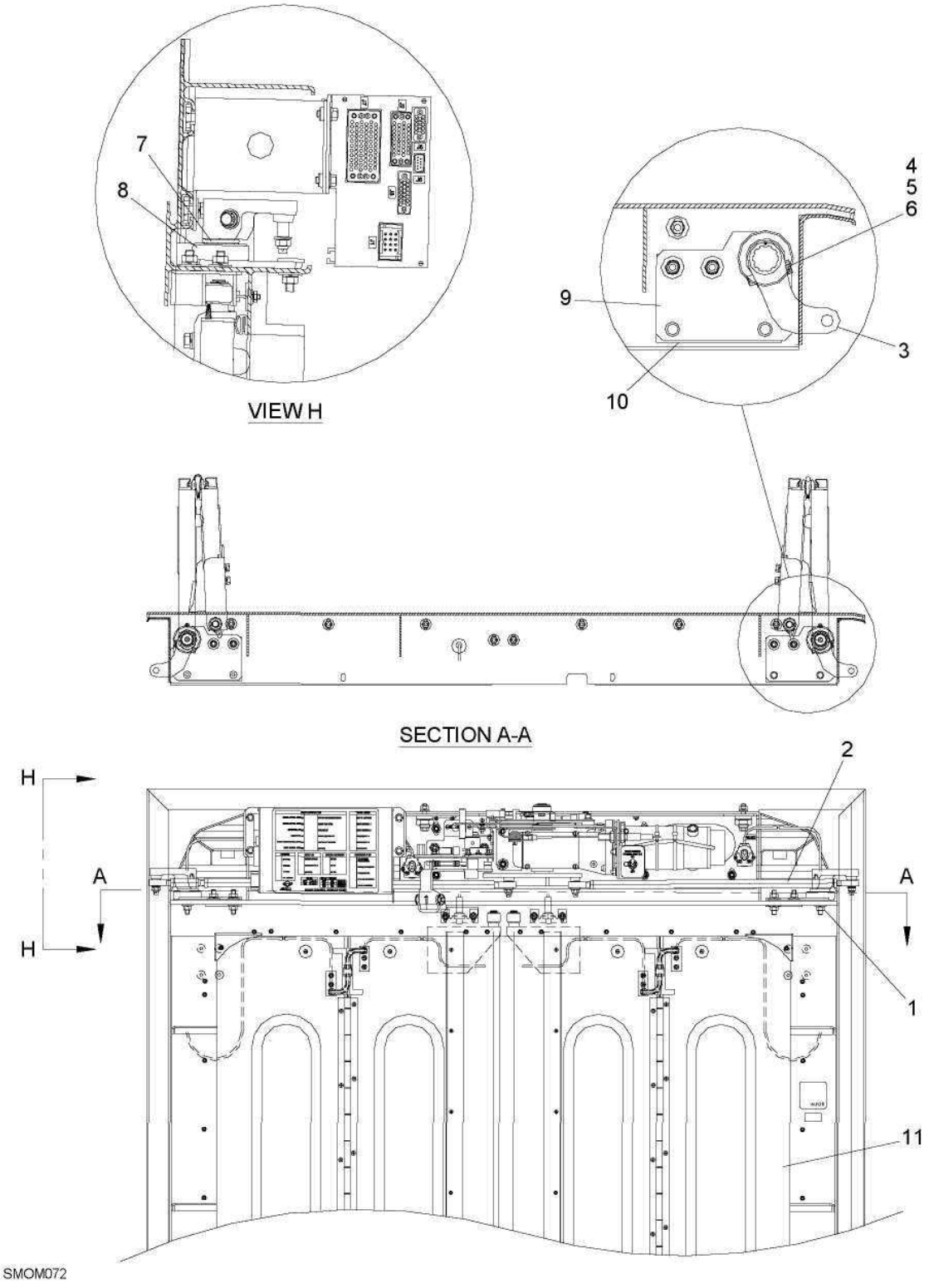

Figure 4-2.12 Removing the Door Panels

ITEM NO.	PART NAME	QTY	ITEM NO.	PART NAME	QTY
	Door Panel Assembly	Ref			
1	Sensitive Edge Tubing	Ref	7	Spacer	1
2	Operating Rod	1	8	Bearing Assembly	1
3	Lever Assembly	1	9	Bearing Plate	1
4	Screw	1	10	Mounting Plate	1
5	Locking Wedge	1	11	Door Panel	1
6	Locking Wedge	1			

(C) Right Hand Low Floor Door Assembly

a) Removal for Heavy Maintenance

Refer to Figure 4-2.12. Removing the Door Panels. Remove the right-hand low floor door panels as described below.

1. Disconnect the sensitive edge tubing (1) from the sensitive edge switch on the door operator.
2. Disconnect the operating rod (2) from the lever assembly (3).
3. Back out the screw (4) until the locking wedges (5 and 6) are loosened enough to remove the lever assembly (3).
4. Remove the spacer (7) and bearing assembly (8).
5. Remove the attaching hardware, and remove the bearing plate (9) and mounting plate (10).

WARNING: THE HIGH FLOOR DOOR PANELS WEIGHT 103 POUNDS AND THE LOW FLOOR DOOR PANELS WEIGH 110 POUNDS. THEY ARE HEAVY AND AWKWARD TO LIFT. TO AVOID INJURY, HAVE ASSISTANCE LIFTING THE DOOR PANELS FROM THE MOUNTINGS.

6. Disengage the roller on the roller bracket from the roller channel on the car body, and lift the door panels (11) from the lower pivot socket.

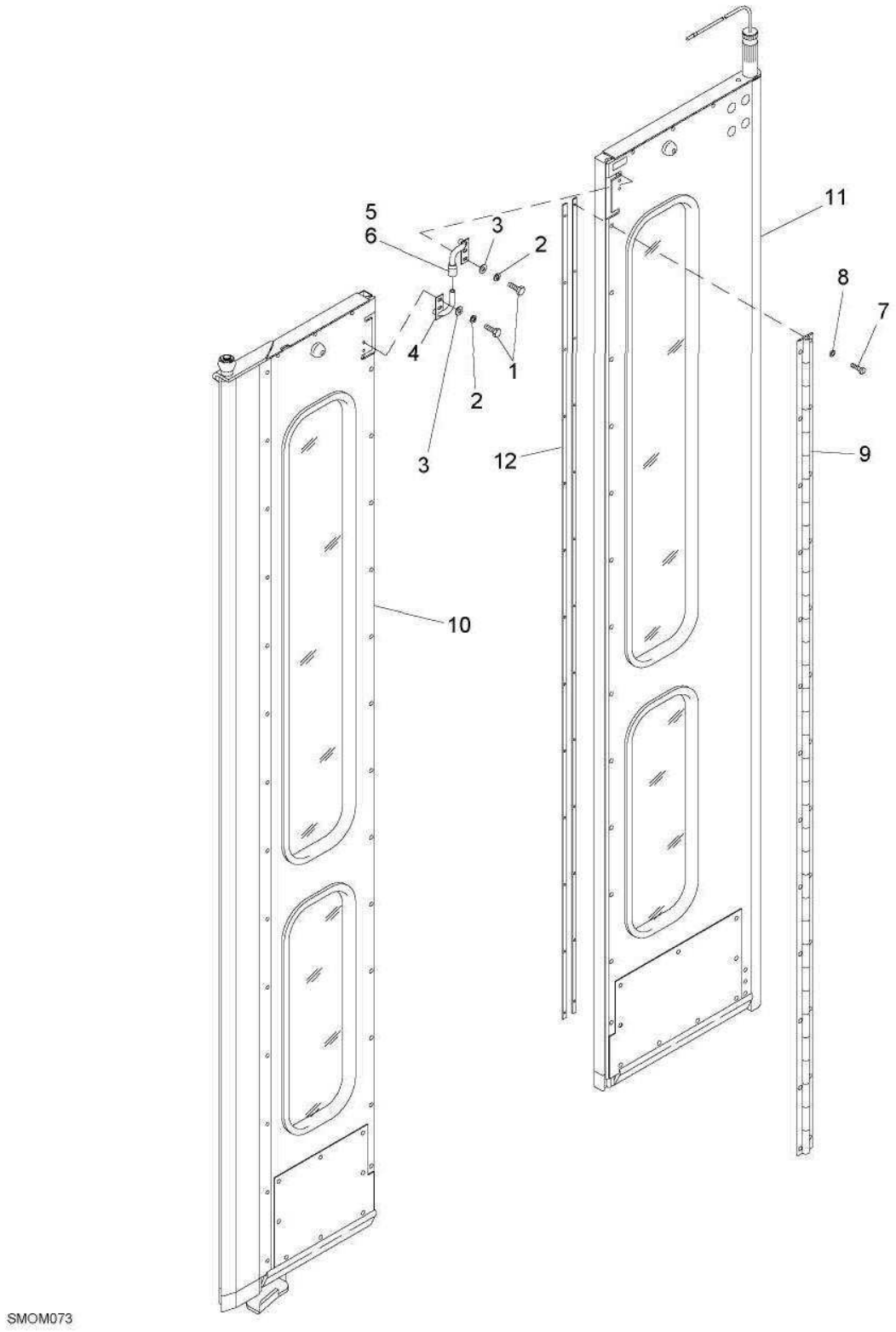

Figure 4-2.13. Separating the Door Panels (Step 1)

ITEM NO.	PART NAME	QTY	ITEM NO.	PART NAME	QTY
	Door Assembly				
1	Pan Head Screw	4	7	Pan Head Screw	26
2	Lockwasher	4	8	Lockwasher	26
3	Plain Washer	4	9	Hinge	1
4	Transfer Tube	1	10	Door Center Panel	1
5	Transfer Tube	1	11	Door Hinge Panel	1
6	Alignment Sleeve	1	12	Tapping Strip	2

General Disassembly Instructions

During scheduled overhauls, remove and discard the following parts and replace them with new:

- All attaching parts
- All retaining rings
- Door seals
- Window seals
- Wear components

b) Right-Hand Low Floor Door Disassembly Instructions

i) Separate Center Door Panels

Disassemble the right-hand low floor door as described below. Refer to Figure 4-2.13. Separating the Door Panels (Step 1). Separate the center door panel from the hinged door panel as described below.

1. Remove four screws (1), four lockwashers (2), and four plain washers (3). This frees the guide assembly transfer tubes (4 and 5) and the integral alignment sleeve (6).
2. Remove the sensitive edge tubing from the transfer tubes (4 and 5).
3. Remove 13 screws (7) and 13 lockwashers (8) from the center panel side of the center hinge (9) and separate the door center panel (10) from the hinge panel (11). This frees the door center panel and one tapping strip (12).
4. Remove 13 screws (7) and 13 lockwashers (8) from the hinge panel side of the door center hinge (9) and separate the door center hinge from the hinge panel (11). This frees the remaining tapping strip (12).

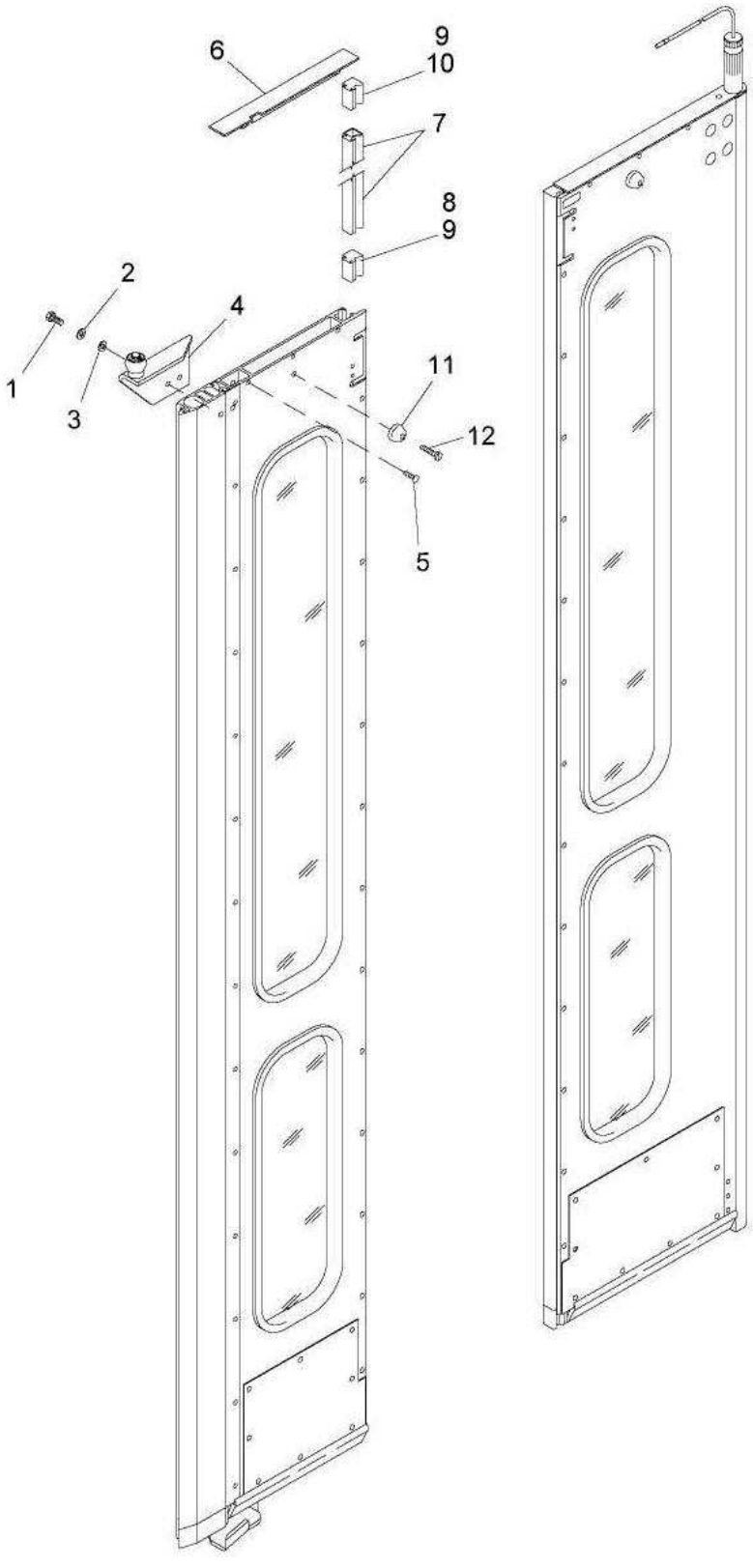

Figure 4-2.14. Door Center Panel Upper Edge Components (Step 2)

ITEM NO.	PART NAME	QTY	ITEM NO.	PART NAME	QTY
	Door Assembly				
1	Hex Head Screw	2	8	Seal Plug	1
2	Lockwasher	2	9	Adhesive	AR
3	Plain Washer	2	10	Door Frame Cap	1
4	Roller Bracket Assembly	1			
5	Flat Head Screw	3	11	Bumper	1
6	Panel Cap	1	12	Pan Head Screw	1
7	Biparting Seal	1	13	Lockwasher	1

ii) Remove Center Panel Upper Edge Components

Refer to Figure 4-2.14. Door Center Panel Upper Edge Components (Step 2). Remove the door center panel upper edge components as described below.

1. Remove two screws (1), two lockwashers (2), and two plain washers (3), and remove the roller bracket assembly (4).
2. Remove three flat head recessed screws (5), and remove the panel cap (6).
3. Slide the biparting seal (7) from its track in the edge of the door panel. This biparting seal includes the seal plug (8) and the door frame cap (10), which are bonded to the biparting seal (7) at assembly using the adhesive (9).
4. Remove the bumper (11) by removing one pan head screw (12) and one lockwasher (13).

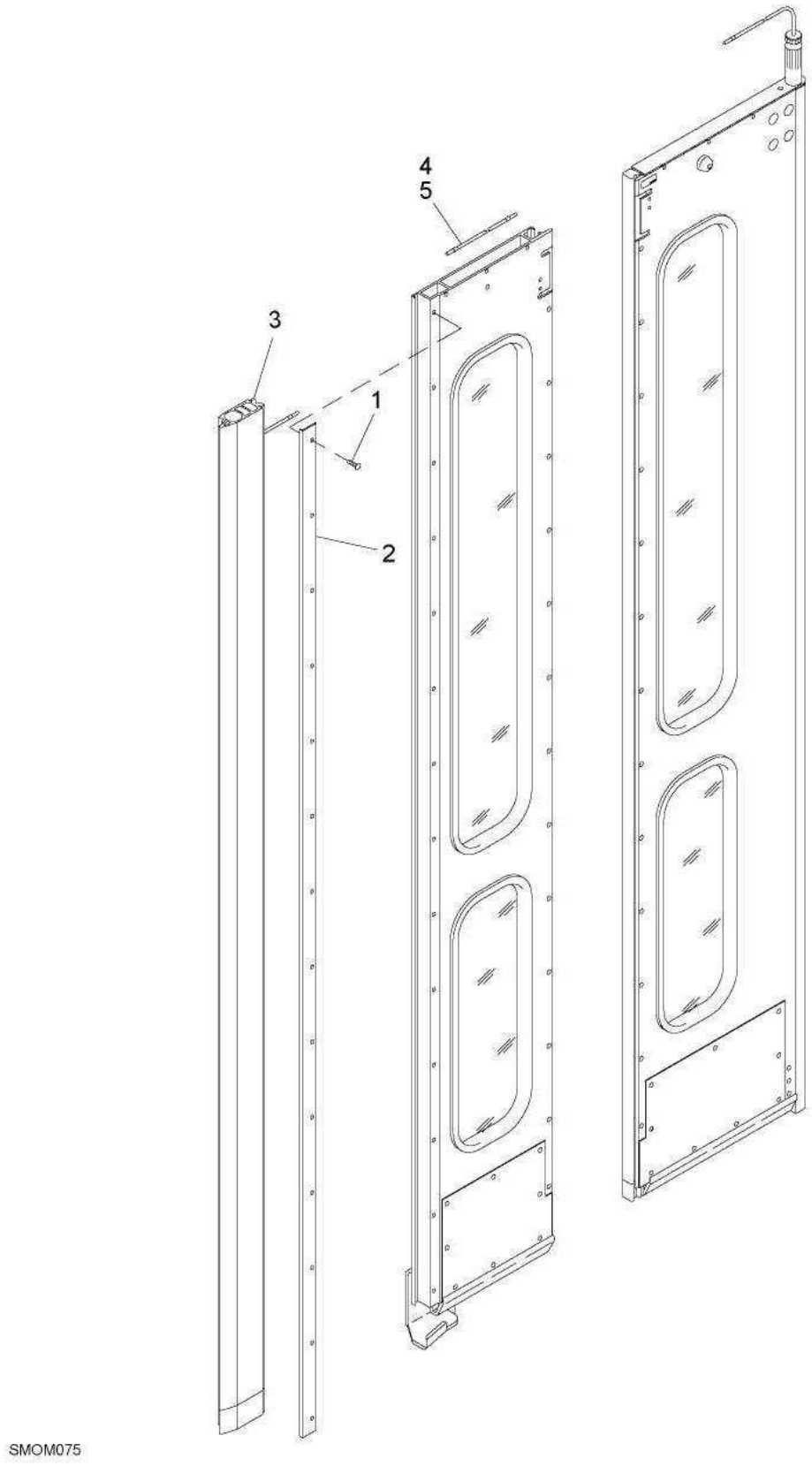

Figure 4-2.15. Door Center Panel Sensitive Edge Assembly (Step 3)

ITEM NO.	PART NAME	QTY	ITEM NO.	PART NAME	QTY
	Door Assembly				
1	Flat Head Screw	14	4	Tubing	AR
2	Edge Retainer	1	5	Connector	2
3	Sensitive Edge Assembly	1			

iii) Remove Center Panel Sensitive Edge

Refer to Figure 4-2.15. Door Center Panel Sensitive Edge Assembly (Step 3). Remove the door center panel sensitive edge and related components as described below.

1. Remove 14 screws (1) from the edge retainer (2). Remove the edge retainer
2. Pull the door sensitive edge (3) from the edge of the door panel.
3. Disconnect the tubing (4) and connector (5) from the sensitive edge.
4. Remove the tubing section and connector from the top interior of the door panel

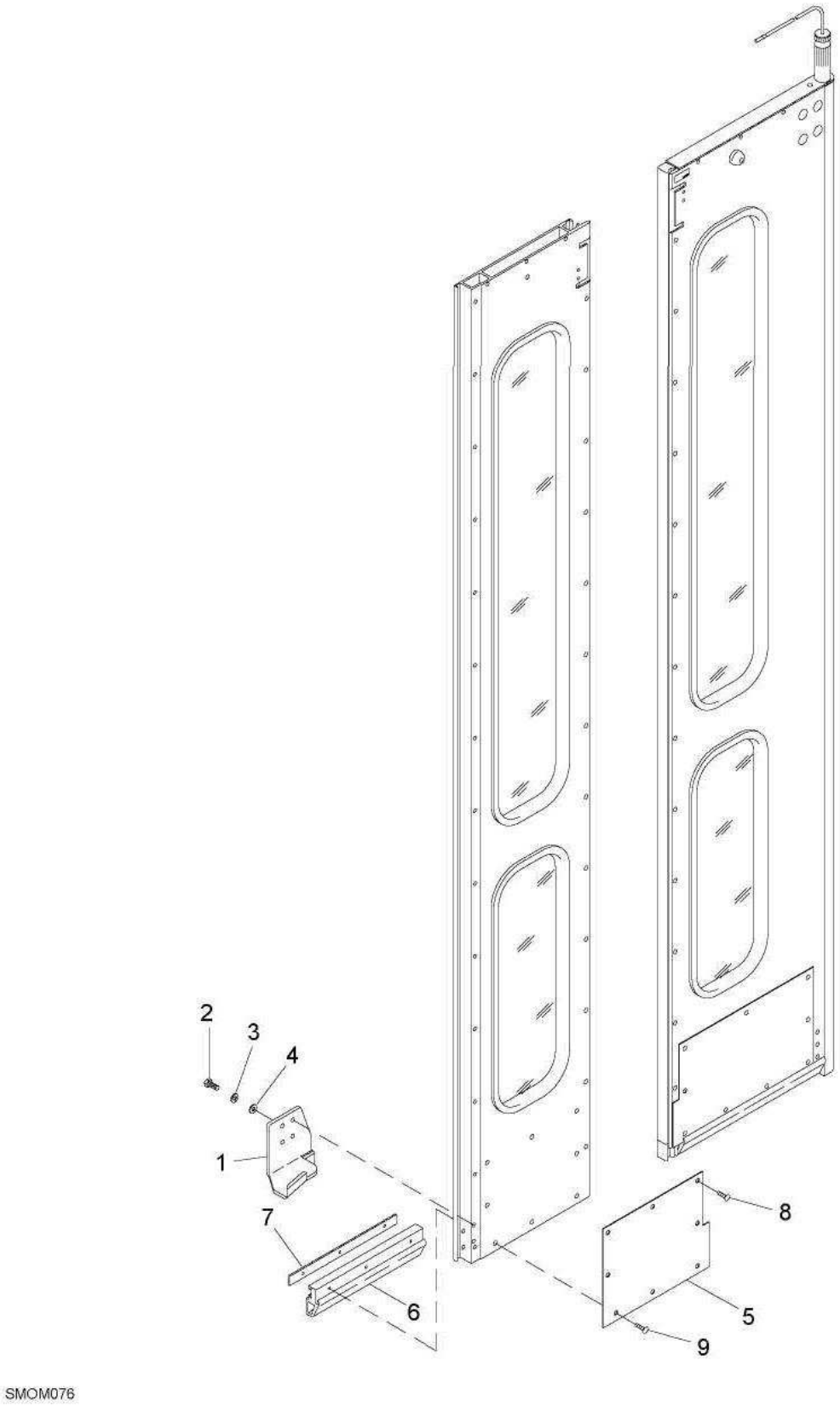

Figure 4-2.16. Bottom Edge Components (Step 4)

ITEM NO.	PART NAME	QTY	ITEM NO.	PART NAME	QTY
	Door Assembly	Ref			
1	Guide Bracket, RH	1	6	Bottom Seal	1
2	Hex Head Cap Screw	4	7	Tapping Pad	1
3	Lockwasher	4	8	Screw	5
4	Plain Washer	4	9	Screw	3
5	Kick Plate, LH	1			

iv) Remove Door Bottom Edge Components

1. Refer to Figure 4-2.16. Bottom Edge Components (Step 4). Remove the door bottom edge components as described below.
2. Remove the guide bracket (1) by removing four screws (2), lockwashers (3), and plain washers (4). Discard the screws and washers.
3. Remove the left-hand kick plate (5), the bottom seal (6), and the tapping pad (7) by removing five screws (8) and three screws (9). Discard the screws.

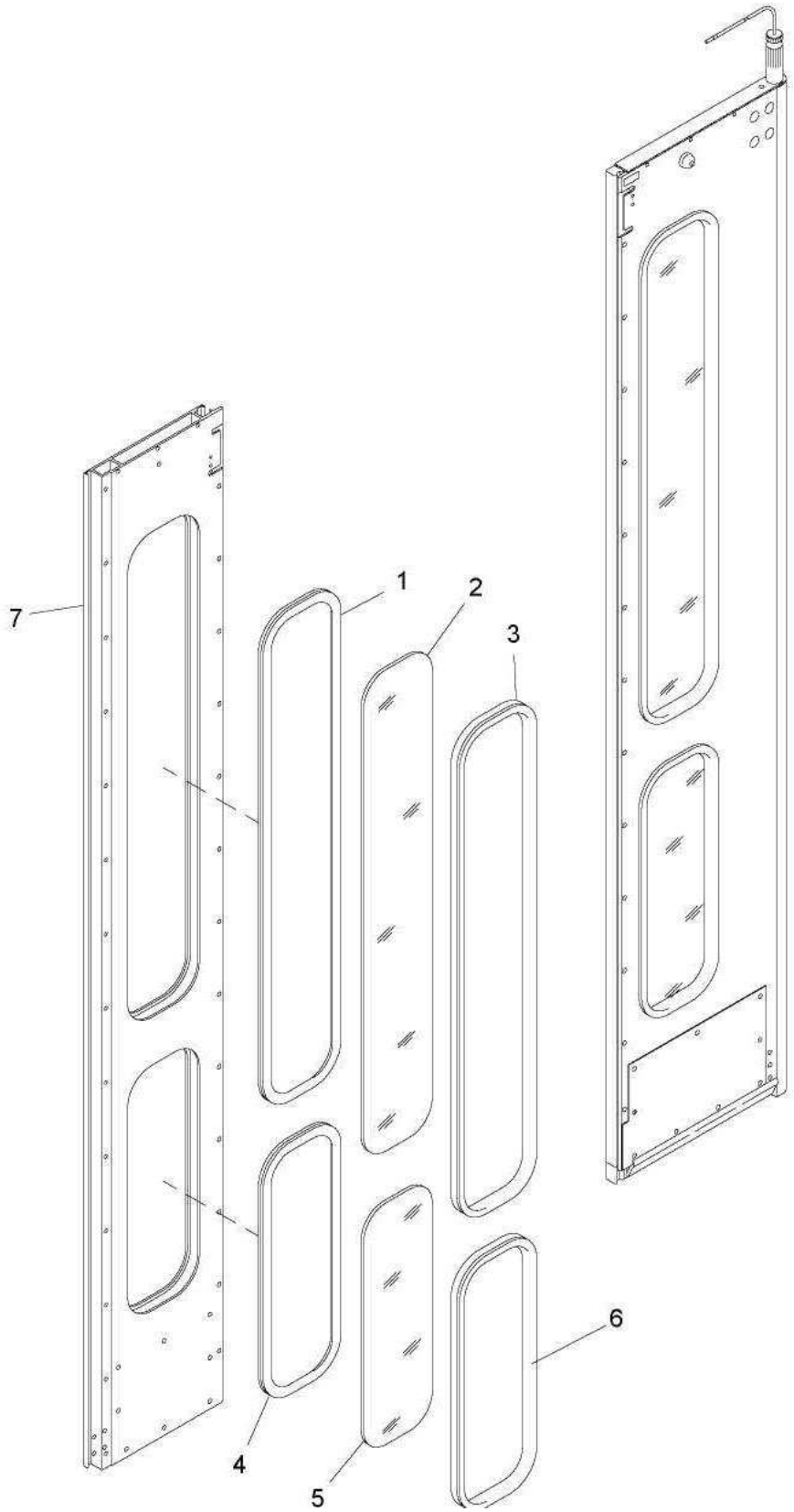

Figure 4-2.17. Center Door Panel Windows (Step 5)

ITEM NO.	PART NAME	QTY	ITEM NO.	PART NAME	QTY
	Door Assembly	Ref			
1	Outside Window Seal, Upper	1	5	Window Glass, Lower	1
2	Window Glass, Upper	1	6	Inside Window Seal, Lower	1
3	Inside Window Seal, Upper	1	7	Door Center Panel	1
4	Outside Window Seal, Lower	1			

v) Remove Windows

1. Refer to Figure 4-2.17. Center Door Panel Windows (Step 5). Remove the windows as described below.

WARNING: BE EXTREMELY CAREFUL WHILE REMOVING THE WINDOW GLASS. ALTHOUGH THE GLASS IS SAFETY GLASS, THERE IS STILL POTENTIAL FOR INJURY IF THE GLASS IS BROKEN.

2. Remove the upper window glass using a pointed nylon tool. Working from the outside of the door, insert the tool between the outside window seal (1) and the door skin at the top of the door. Grasp the window seal, and pull it downward to remove it.
3. Using the nylon tool, tip the glass (2) free at one side and remove it.
4. If the inside window seal is not damaged, do not remove it. If it is necessary to replace the inside seal (3), grasp the inside seal at the top, and pull the seal from the door skin.
5. Remove the lower window glass using the pointed nylon tool. Working from the outside of the door, insert the tool between the outside window seal (4) and the door skin at the top of the door. Grasp the window seal, and pull it downward to remove it.
6. Using the nylon tool, tip the glass (5) free at one side and remove it.
7. If the inside window seal is not damaged, do not remove it. If it is necessary to replace the inside seal (6), grasp the inside seal at the top, and pull the seal from the door skin. This completes removal of all components from the center door panel (7).

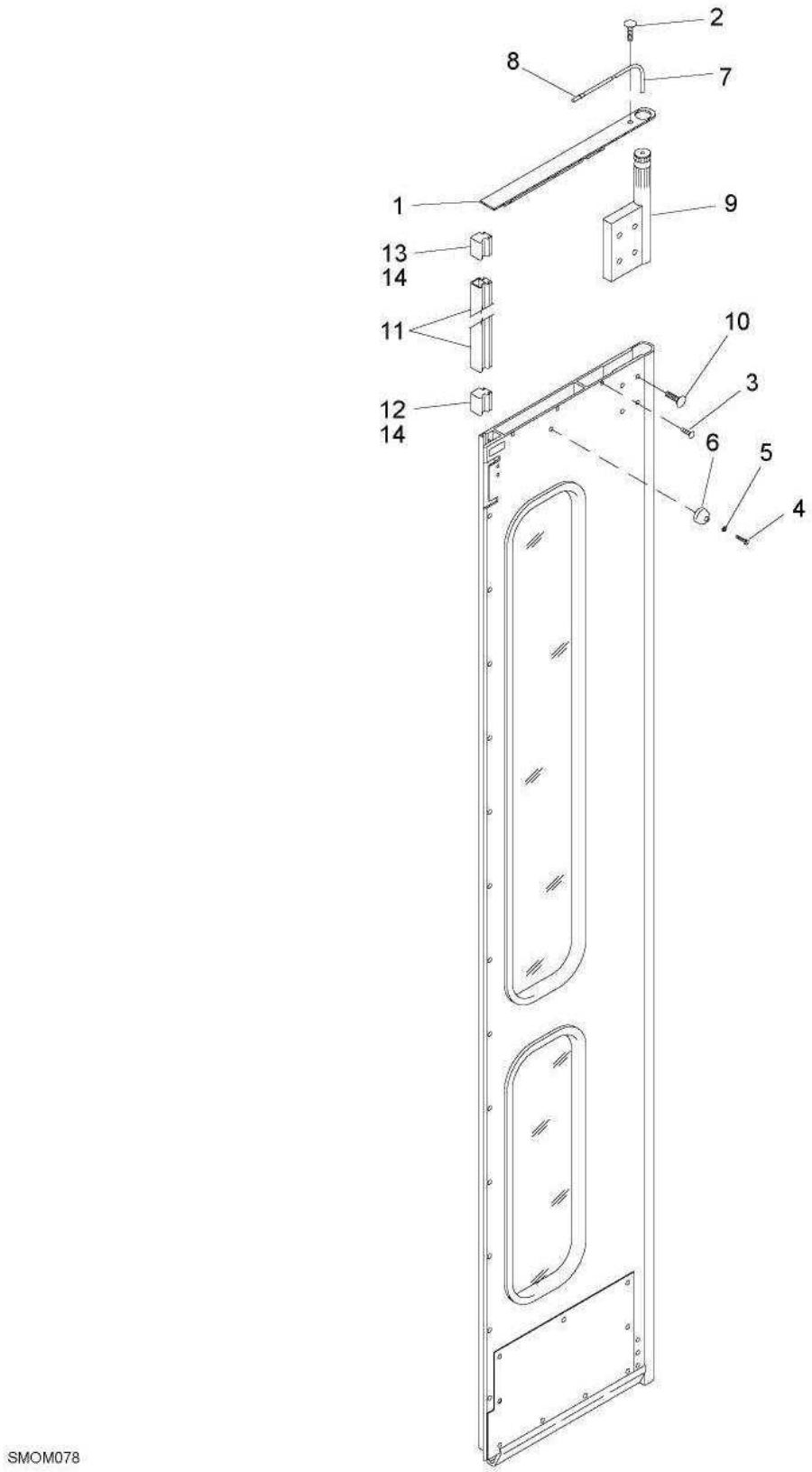

Figure 4-2.18. Door Top Edge Components (Step 6)

ITEM NO.	PART NAME	QTY	ITEM NO.	PART NAME	QTY
	Door Assembly	Ref			
1	Panel Cap	1	8	Connecting Fitting	1
2	Flat Head Screw	1	9	Stub Shaft and Bracket	1
3	Flat Head Screw	3	10	Flat Head Screw	4
4	Pan Head Screw	1	11	Biparting Seal	1
5	Lockwasher	1	12	Plug	1
6	Bumper	1	13	Door Frame Cap	1
7	Tubing	AR	14	Adhesive	AR

vi) Remove Door Top Edge Components

1. Refer to Figure 4-2.18. Door Top Edge Components (Step 6). Remove the door top edge components as described below.
2. Remove the panel cap (1) by removing one screw (2) and three screws (3). Discard the screws.
3. Remove the bumper (6) by removing the screw (4) and lockwasher (5). Discard the screw, washer, and bumper.
4. Remove the connector fitting (8) and the tubing (7). Discard these parts.
5. Remove and discard four screws (10). Slide the stub shaft and bracket (9) from the top of the door.
6. Slide the biparting seal (11) from the door edge. The plug (12) and door frame cap (13) have been bonded to the biparting seal with adhesive (14).

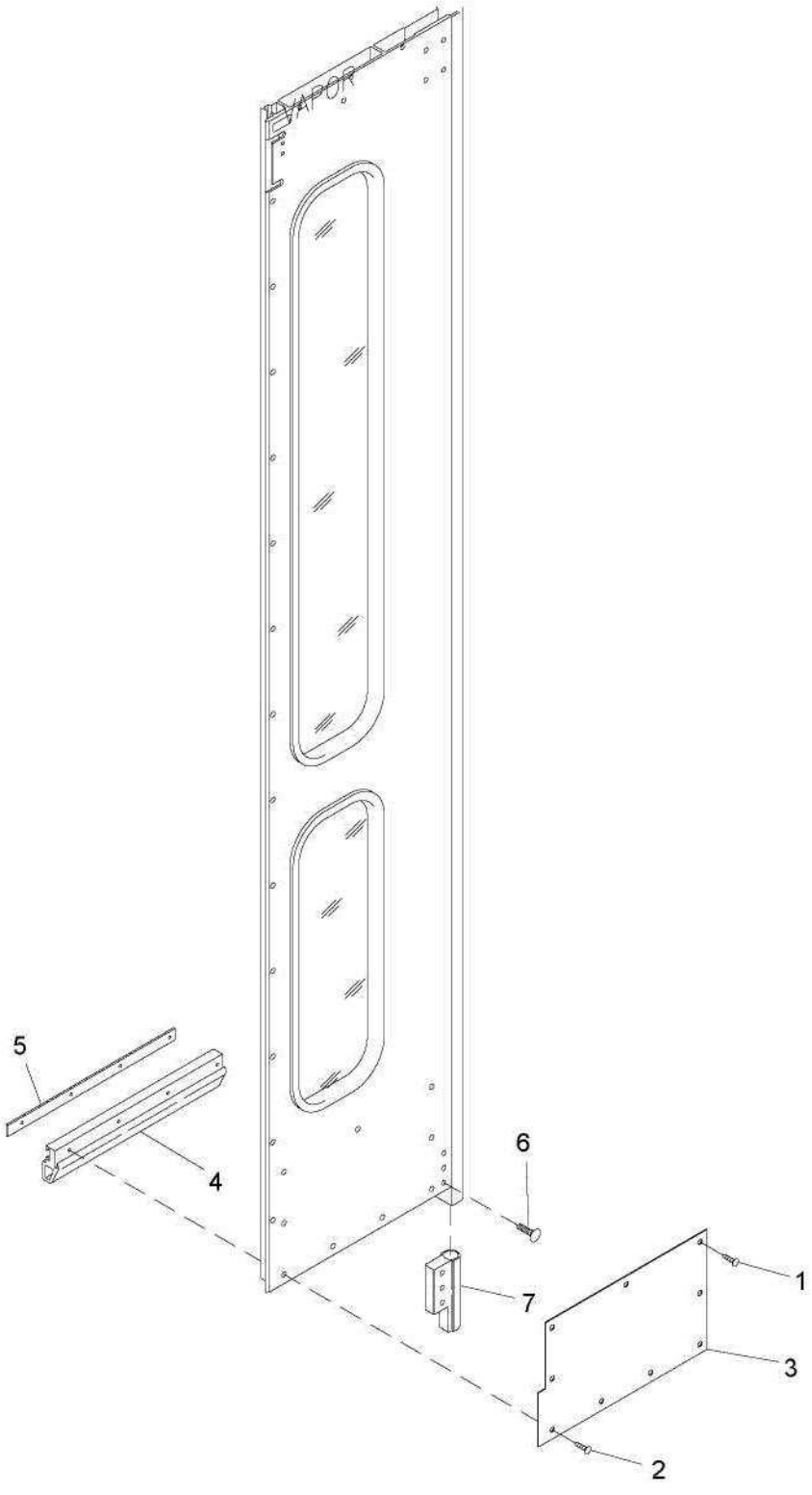

Figure 4-2.19. Bottom Edge Components (Step 7)

ITEM NO.	PART NAME	QTY	ITEM NO.	PART NAME	QTY
	Door Assembly	Ref			
1	Screw	5	5	Tapping Pad	1
2	Screw	4	6	Screw	3
3	Kick Panel	1	7	Pivot Bracket	1
4	Bottom Seal	1			

vii) Remove Door Bottom Edge Components

1. Refer to Figure 4-2.19. Bottom Edge Components (Step 7). Remove the door bottom edge components as described below.
2. Remove and discard five screws (1) and four screws (2) and remove the kick panel (3). This frees the bottom seal (4) and tapping pad (5).
3. Remove and discard bottom seal (4).
4. Remove and discard three screws (6).
5. Slide the pivot bracket (7) from the door bottom edge.

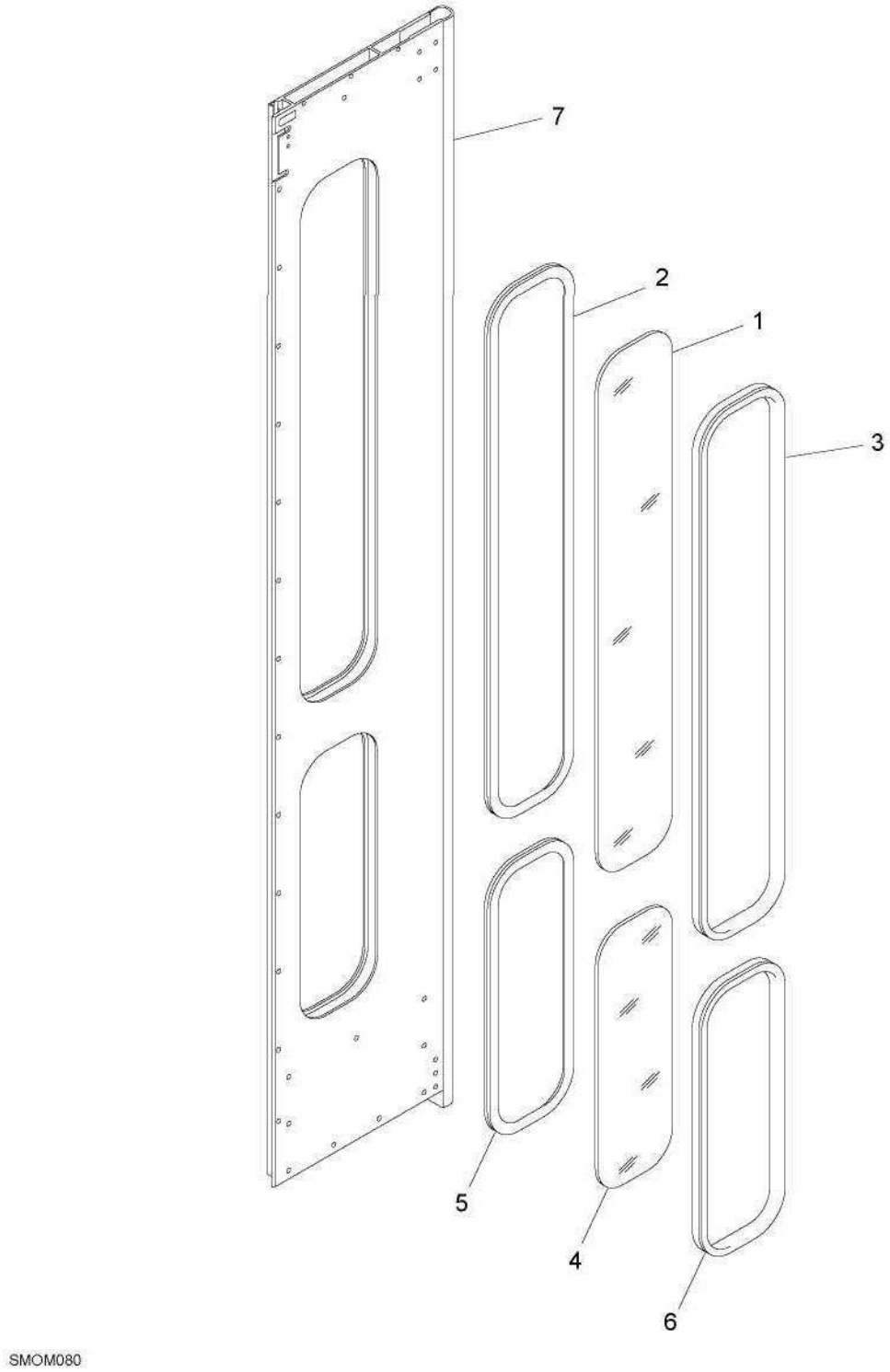

Figure 4-2.20. Hinge Door Windows (Step 8)

ITEM NO.	PART NAME	QTY	ITEM NO.	PART NAME	QTY
	Door Assembly	Ref			
1	Window Glass, Upper	1	5	Outside Window Seal, Lower	1
2	Outside Window Seal, Upper	1	6	Inside Window Seal, Lower	1
3	Inside Window Seal, Upper	1	7	Hinge Door Panel	1
4	Window Glass, Lower	1			

viii) Remove Hinge Door Windows

1. Refer to Figure 4-2.20 Hinge Door Windows (Step 8). Remove the windows as described below.

WARNING: BE EXTREMELY CAREFUL WHILE REMOVING THE WINDOW GLASS. ALTHOUGH THE GLASS IS SAFETY GLASS, THERE IS STILL POTENTIAL FOR INJURY IF THE GLASS IS BROKEN.

2. Remove the upper window glass (1) using a pointed nylon tool. Working from the outside of the door, insert the tool between the outside window seal (2) and the door skin at the top of the door. Grasp the window seal, and pull it downward to remove it.
3. Using the nylon tool, tip the glass (1) free at one side and remove it.
4. If the inside window seal is not damaged, do not remove it. If it is necessary to replace the inside seal (3), grasp the inside seal at the top, and pull the seal from the door skin.
5. Remove the lower window glass (4) using the pointed nylon tool. Working from the outside of the door, insert the tool between the outside window seal (5) and the door skin at the top of the door. Grasp the window seal, and pull it downward to remove it.
6. Using the nylon tool, tip the glass (4) free at one side and remove it.
7. If the inside window seal is not damaged, do not remove it. If it is necessary to replace the inside seal (6), grasp the inside seal at the top, and pull the seal from the door skin. This completes removal of all components from the hinge door panel (7).

(D) Left Hand Low Floor Door Assembly

The left-hand low floor door assembly is identical in structure to the right-hand low floor door assembly. Heavy maintenance of the left-hand low floor door assembly is

identical to heavy maintenance for the right-hand low floor door assembly. Refer to section 4-2.1.2.d (C).

4-2.1.2.e Cleaning/Painting

a) Cleaning

- **Reference Information.**
  1. Tools / Equipment.
     – MBTA approved Cleaning Tools / Equipment (commercial).
  2. Material.
     – MBTA approved Cleaning Products (commercial) (Refer to Section 1 Table 1-9).
     –

ix) Right Hand High Floor Door Assembly

Door Component Cleaning

Clean the door components to allow inspection according to Table 4-2.19

After cleaning, inspect all components to protect them from corrosion, and apply light coat of protective oil to ferrous part that are not protected by plating or black oxide

Table 4-2.19 Door Component Cleaning Instructions

FIGURE AND ITEM	PART NAME	CLEANING METHODS AND MATERIALS
Figure 4-2.12-2	Operating rod	Clean with a nonvolatile, residue free solvent; air blow dry.
-3	Lever assembly	
-5-6	Locking wedge	
-7	Spacer	
-9	Bearing plate	
-10	Mounting plate	
Figure 4-2.13 -4 -5	Transfer tube	Clean with a nonvolatile, residue free solvent; air blow dry; make sure the tube interiors are completely dry.
-6	Alignment sleeve	Integral part of transfer tube
-9	Door hinge	Clean with a nonvolatile, residue free solvent; air blow dry.
-10	Door center	Clean with a nonvolatile, residue free solvent; air blow dry

FIGURE AND ITEM	PART NAME	CLEANING METHODS AND MATERIALS
	panel	or wipe dry with clean, lint-free cloths.
-11	Door hinge panel	Clean with a nonvolatile, residue free solvent; air blow dry or wipe dry with clean, lint-free cloths.
-12	Tapping strip	Clean with a nonvolatile, residue free solvent; air blow dry.
Figure 4-2.14 -4	Roller bracket assembly	Clean with a nonvolatile, residue free solvent; air blow dry..
-6	Panel cap	Clean with a nonvolatile, residue free solvent; air blow dry.
Figure 4-2.15 -2	Edge retainer	
Figure 4-2.16 -1	Guide bracket	
-5	Kick plate	
-7	Tapping pad	
Figure 4-2.17 -2 -5	Window glass	Clean with commercially available glass cleaners. Wipe dry with lint-free cloth.
-7	Door center panel	Clean with a nonvolatile, residue free solvent; air blow dry or wipe dry with clean, lint-free cloths.
Figure 4-2.18 -1	Panel cap	Clean with a nonvolatile, residue free solvent; air blow dry.
-9	Stub shaft and bracket	
Figure 4-2.19 -3	Kick panel	
-5	Tapping pad	
-7	Pivot bracket	
Figure 4-2.20 -1 -4	Window glass	Clean with commercially available glass cleaners; wipe dry with lint-free cloth.
-7	Door hinge panel	Clean with a nonvolatile, residue free solvent; air blow dry or wipe dry with clean, lint-free cloths.

x) Right Hand Low Floor Door Assembly

Door Component Cleaning

Clean the door components to allow inspection as defined in Table 4-2.20 Door Component Cleaning Instructions.

After cleaning, inspect all components to protect them from corrosion, and apply light coat of protective oil to ferrous part that are not protected by plating or black oxide

Table 4-2.20. Door Component Cleaning Instructions

FIGURE AND ITEM	PART NAME	CLEANING METHODS AND MATERIALS
Figure 4-2.12 -2	Operating rod	Clean with a nonvolatile, residue free solvent; air blow dry.
-3	Lever assembly	
-5 -6	Locking wedge	
-7	Spacer	
-9	Bearing plate	
-10	Mounting plate	
Figure 4-2.13 -4 -5	Transfer tube	Clean with a nonvolatile, residue free solvent; air blow dry; make sure the tube interiors are completely dry.
-6	Alignment sleeve	Integral part of transfer tube.
-9	Door hinge	Clean with a nonvolatile, residue free solvent; air blow dry.
-10	Door center panel	Clean with a nonvolatile, residue free solvent; air blow dry or wipe dry with clean, lint-free cloths.
-11	Door hinge panel	Clean with a nonvolatile, residue free solvent; air blow dry or wipe dry with clean, lint-free cloths.
-12	Tapping strip	Clean with a nonvolatile, residue free solvent; air blow dry.
Figure 4-2.14 -4	Roller bracket assembly	Clean with a nonvolatile, residue free solvent; air blow dry.
-6	Panel cap	Clean with a nonvolatile, residue free solvent; air blow dry.
Figure 4-2.15 -2	Edge retainer	
Figure 4-2.16 -1	Guide bracket	
-5	Kick plate	
-7	Tapping pad	
Figure 4-	Window glass	Clean with commercially available glass cleaners. Wipe dry

FIGURE AND ITEM	PART NAME	CLEANING METHODS AND MATERIALS
2.17 -2 -5		with lint-free cloth.
-7	Door center panel	Clean with a nonvolatile, residue free solvent; air blow dry or wipe dry with clean, lint-free cloths.
Figure 4-2.18 -1	Panel cap	Clean with a nonvolatile, residue free solvent; air blow dry.
-9	Stub shaft and bracket	
Figure 4-2.19 -3	Kick panel	
-5	Tapping pad	
-7	Pivot bracket	
Figure 4-2.20 -1 -4	Window glass	Clean with commercially available glass cleaners; wipe dry with lint-free cloth.

4-2.1.2.f Inspection

- **Reference Information.**
  1. Tools / Equipment (Not Applicable).
     – MBTA Carhouse Standard Tools Kit.
  2. Material (Not Applicable).

Door Component Inspection

Inspect the door components in accordance with the specific instructions provided in Table 4-2.21

(A) Right Hand High Floor Door Assembly

Table 4-2.21. Door Component Inspection Methods and Criteria

FIGURE AND ITEM	PART NAME	INSPECTION METHODS AND CRITERIA
Figure 4-2.12 -2	Operating rod	Visually inspect for deformation, corrosion, excessive wear, and damage. Replace, as necessary.
-3	Lever assembly	
-5 -6	Locking wedge	
-7	Spacer	
-9	Bearing plate	
-10	Mounting plate	
Figure 4-2.13 -4 -5	Transfer tube	
-6	Alignment sleeve	
-9	Door hinge	
-10	Door center panel	
-11	Door hinge panel	
-12	Tapping strip	Visually inspect for deformation, corrosion, excessive wear, and damage. Carefully inspect the threaded holes for damage threads. Replace, as necessary.
Figure 4-2.14 -4	Roller bracket assembly	Roller Bracket Component Inspection Methods and Criteria.
-6	Panel cap	Visually inspect for deformation, corrosion, excessive wear, and damage. Replace, as necessary.
Figure 4-2.15-2	Edge retainer	
Figure 4-2.16-1	Guide bracket	
-5	Kick plate	
-7	Tapping pad	
Figure 4-2.17-1 -4	Window glass	Visually inspect the glass for chips or cracks that might affect the window life, and for scratching and hazing that affects its transparency.

FIGURE AND ITEM	PART NAME	INSPECTION METHODS AND CRITERIA
		Replace chipped and cracked glass. Replace glass that has lost transparency from scratching and age deterioration.
Figure 4-2.18-1	Panel cap	Visually inspect for deformation, corrosion, excessive wear, and damage. Replace, as necessary.
-9	Stub shaft and bracket assembly	
Figure 4-2.19-3	Kick panel	
-5	Tapping pad	Visually inspect for deformation, corrosion, excessive wear, and damage.
		Carefully inspect the threaded holes for damage threads. Replace, as necessary.
-7	Pivot bracket	Visually inspect for deformation, corrosion, excessive wear, and damage. Replace, as necessary.
Figure 4-2.20-1 -4	Window glass	Visually inspect the glass for chips or cracks that might affect the window life, and for scratching and hazing that affects its transparency. Replace chipped and cracked glass. Replace glass that has lost transparency from scratching and age deterioration.

(B) Right Hand Low Floor Door Assembly

Door Component Inspection

Inspect the door components in accordance with the specific instructions provided in Table 4-2.22

Table 4-2.22. Door Component Inspection Methods and Criteria

FIGURE AND ITEM	PART NAME	INSPECTION METHODS AND CRITERIA
Figure 4-2.12-2	Operating rod	Visually inspect for deformation, corrosion, excessive wear, and damage. Replace, as necessary.
-3	Lever assembly	
-5 -6	Locking wedge	
-7	Spacer	
-9	Bearing plate	
-10	Mounting plate	
Figure 4-2.13-4 -5	Transfer tube	
-6	Alignment sleeve	
-9	Door hinge	
-10	Door center panel	
-11	Door hinge panel	
-12	Tapping strip	Visually inspect for deformation, corrosion, excessive wear, and damage. Carefully inspect the threaded holes for damage threads. Replace, as necessary.
Figure 4-2.14-4	Roller bracket assembly	Visually inspect for wear and corrosion, replace if worn or corroded
-6	Panel cap	Visually inspect for deformation, corrosion, excessive wear, anddamage. Replace, as necessary.
Figure 4-2.15-2	Edge retainer	
Figure 4-2.16-1	Guide bracket	
-5	Kick plate	
-7	Tapping pad	
Figure 4-2.17-2	Window glass	Visually inspect the glass for chips or cracks that might affect the window life, and for scratching and hazing that affects its transparency.

-5		Replace chipped and cracked glass. Replace glass that has lost transparency from scratching and age deterioration.
Figure 4-2.18-1	Panel cap	Visually inspect for deformation, corrosion, excessive wear, and damage. Replace, as necessary.
-9	Stub shaft and bracket assembly	
Figure 4-2.19-3	Kick panel	
-5	Tapping pad	Visually inspect for deformation, corrosion, excessive wear, and damage. Carefully inspect the threaded holes for damage threads. Replace, as necessary.
-7	Pivot bracket	Visually inspect for deformation, corrosion, excessive wear, and damage. Replace, as necessary.
Figure 4-2.20 -4	Window glass	Visually inspect the glass for chips or cracks that might affect the window life, and for scratching and hazing that affects its transparency. Replace chipped and cracked glass. Replace glass that has lost transparency from scratching and age deterioration.

4-2.1.2.g Repair (Not Applicable)

4-2.1.2.h Reassembly

- **Reference Information.**
  1. Tools / Equipment.
     – MBTA Overhaul Standard Tools Kit.
  2. Material (Not Applicable).
- **Procedure**

(A) Right Hand High Floor Door Assembly

a) Reassembly

xi) Hinge Door Windows

Refer to Figure 4-2.20. Hinge Door Windows (Step 8). Install the door glass into the hinge door panel as described below.

1. If the lower inside window seal was not removed, proceed to step b, below. If the lower inside seal (6) was removed, install the lower inside seal (6) according to the following procedure.
2. Position the window seal at the top center of the window opening and press the window seal onto the inner door skin.
3. Press the bottom center of the window seal onto the door skin at the bottom center of the opening.
4. Press the window seal over the door skin, starting at bottom center and working upward evenly in both directions.

NOTE: The window seal must be completely and evenly seated around the circumference of the opening, and must not be stretched or bunched at any point.

5. Insert the lower window glass (4) from the outside surface of the door and position the lower window glass in the inside window seal.
6. Install the lower outside window seal (5).
7. Start at the top center and press the window seal in place.
8. Then, press in the bottom center of the window seal, and feed the sides onto the door skin.
9. When the window seal has been fed completely onto the door skin, even and seat the window seal using a nylon block and rubber mallet. Position the block against the window seal so that striking the block with the mallet will seat the window seal around the door skin and lock the outer window seal to the inside window seal.

10. Check to make sure the outside window seal is seated and locked to the inside window seal. If both window seals are seated correctly and locked there will be no gaps between the window seal and the window glass. The outside window seal cannot be grasped and pulled away from the window by hand.
11. If the upper inside window seal was not removed, proceed to step e, below. If the upper inside seal (3) was removed, install the upper inside window seal (3) according to the following procedure.
12. Position the window seal at the top center of the window opening and press the window seal onto the inner door skin.
    a. Press the bottom center of the window seal onto the door skin at the bottom center of the opening.
    b. Press the window seal over the door skin, starting at bottom center and working upward evenly in both directions.

NOTE: The window seal must be completely and evenly seated around the circumference of the opening, and must not be stretched or bunched at any point.

13. Insert the upper window glass (1) from the outside surface of the door and position the upper window glass in the inside window seal.
14. Install the upper outside window seal (2).
15. Start at the top center and press the window seal in place.
16. Then, press in the bottom center of the window seal, and feed the sides onto the door skin.
17. When the window seal has been fed completely onto the door skin, even out and seat the window seal using a nylon block and rubber mallet. Position the block against the window seal so that striking the block with the mallet will seat the window seal around the door skin and lock the outer window seal to the inside window seal.
18. Check to make sure the outside window seal is seated and locked to the inside window seal. If both window seals are seated correctly and locked there will be no gaps between the window seal and the window glass. The outside window seal cannot be grasped and pulled away from the window by hand.

xii) Bottom Edge Components

Refer to Figure 4-2.19. Bottom Edge Components (Step 7). Install the hinge door panel bottom edge components as described below.

1. Slide the pivot bracket (7) into the door bottom edge.
2. Align the tapped holes in the pivot bracket with the screw holes in the door panel inner skin. Insert three screws (6), and tighten the screws to 13 ± 1 foot pounds.

3. Install the kick panel (3) on the inner door skin. Attach the plate with five screws (1). Tighten the screws to 10 ± 1 inch pounds.

4. Install a new bottom seal (4) and the tapping pad (5), using four screws (2). Tighten the screws to 20 ± 2 inch pounds.

xiii) Top Edge Components

Refer to Figure 4-2.18. Door Top Edge Components (Step 6). Install the hinge door panel top edge components as described below.

1. Use Slip-Eaze or a solution of half soap and half water to lubricate the biparting seal assembly (11). Install the biparting seal by sliding it into the door edge. When correctly positioned, the door seal will be flush with to slightly below the top and bottom of the door skin.

2. Insert a six-foot length of new tubing (7) through the transfer tube hole and into the top of the door cavity. Tape the end of the tubing to the outside of the door skin where it enters the door cavity through the transfer tube hole to prevent it from being lost inside the door cavity.

3. Feed the tubing (7) through the bottom of the stub shaft and bracket (9) and out the top of the stub shaft. Tape the tubing to the stub shaft and bracket.

4. Slide the stub shaft and bracket (9) into the door top edge.

5. Align the tapped holes in the stub shaft and bracket with the screw holes in the door panel inner skin. Insert four screws (10), and tighten the screws to 11 ± 1 foot pounds.

6. Feed the tubing end from the stub shaft and bracket through the stub shaft hole on the panel cap (1).

7. Insert the panel cap into the top edge of the door panel and install three flat head screws (3) and one screw (2). Tighten the screws to 11 ± 1 inch pounds.

8. Install the bumper (6), using one screw (4) and one washer (5). Tighten the screw securely without deforming the bumper.

xiv) Install Door Glass

Refer to Figure 4-2.17. Center Door Panel Windows (Step 5). Install the door glass into the center door panel as described below.

1. If the lower inside window seal was not removed, proceed to step b, below. If the lower inside seal (6) was removed, install the lower inside seal (6) according to the following procedure.

2. Position the window seal at the top center of the window opening and press the window seal onto the inner door skin.

3. Press the bottom center of the window seal onto the door skin at the bottom center of the opening.

4. Press the window seal over the door skin, starting at bottom center and working upward evenly in both directions.

NOTE: The window seal must be completely and evenly seated around the circumference of the opening, and must not be stretched or bunched at any point.

5. Insert the lower window glass (5) from the outside surface of the door and position the lower window glass in the inside window seal.
6. Install the outside lower window seal (4).
   a. Start at the top center and press the window seal in place.
   b. Then, press in the bottom center of the window seal, and feed the sides onto the door skin.
   c. When the window seal has been fed completely onto the door skin, even and seat the window seal using a nylon block and rubber mallet. Position the block against the window seal so that striking the block with the mallet will seat the window seal around the door skin and lock the outer window seal to the inner window seal.
   d. Check to make sure the outside window seal is seated and locked to the inside window seal. If both window seals are seated correctly and locked there will be no gaps between the window seal and the window glass. The outside window seal cannot be grasped and pulled away from the window by hand.
7. If the upper inner window seal was not removed, proceed to step e, below. If the upper inner seal (3) was removed, install the upper window inner seal (3) according to the following procedure.
   a. Position the window seal at the top center of the window opening and press the window seal onto the inner door skin.
   b. Press the bottom center of the window seal onto the door skin at the bottom center of the opening.
   c. Press the window seal over the door skin, starting at bottom center and working upward evenly in both directions.

NOTE: The window seal must be completely and evenly seated around the circumference of the opening, and must not be stretched or bunched at any point.

8. Insert the upper window glass (2) from the outside surface of the door and position the upper window glass in the inside window seal.
9. Install the upper outside window seal (1).
   a. Start at the top center and press the window seal in place.
   b. Then, press in the bottom center of the window seal, and feed the sides onto the door skin.

c. When the window seal has been fed completely onto the door skin, even and seat the window seal using a nylon block and rubber mallet. Position the block against the window seal so that striking the block with the mallet will seat the window seal around the door skin and lock the outer window seal to the inner window seal.

d. Check to make sure the outside window seal is seated and locked to the inside window seal. If both window seals are seated correctly and locked there will be no gaps between the window seal and the window glass. The outside window seal cannot be grasped and pulled away from the window by hand.

10. Refer to Figure 4-2.19. Bottom Edge Components (Step 7) Install the center door bottom edge components as described below.

11. Install the kick plate (5) with five screws (8), tightening the screws to 10 ± 1 inch pounds.

12. Install the tapping pad (7) and bottom seal (6) using three screws (9). Tighten the screws to 20 ± 2 inch pounds.

13. Install the guide bracket (1) with four washers (4), four lockwashers (3), and four screws (2). Tighten the screws to 11 ± 1 foot pounds.

14. (Refer to Figure 4-2.15. Door Center Panel Sensitive Edge Assembly (Step 3)) Install the sensitive edge assembly as described below.

15. Install a six-foot length of tubing (4) through the port in the door skin for the transfer tube assembly. Leave approximately two inches of tube protruding through the transfer tube port. Tape the end to the door so it cannot be pulled into the door.

16. Feed the free end of the tube through the hole in the edge of the door for the tube from the sensitive edge assembly.

17. Install a connector (5) over one end of the tubing (4).

18. Install the connector over the tube on the sensitive edge (3).

19. If necessary, coat the sensitive edge with Slip-Eaze or a half-and-half solution of dish soap and water, which will provide lubrication while the sensitive edge is being slid into the slot.

20. Position the sensitive edge so its protruding tube will enter the hole in the door edge.

21. Push the sensitive edge into the slot. The sensitive edge is correctly positioned when it is flush with to slightly inside the top and bottom surfaces of the door panel, and the protruding tube sticks straight into the door.

22. Make sure the screw holes are properly aligned, and install the edge retainer (2) with 10 flat head screws (1). Tighten the screws to 13 ± 1 inch pounds.

23. Pull the taped end of the tube through the transfer tube hole until there is approximately two inches of extra tubing in the door interior.

24. (Refer to Figure 4-2.14. Door Center Panel Upper Edge Components (Step 2)) Install the door center panel upper edge components as described below.

25. Install the stop pad (11), using one pop rivet (12). Use an appropriate rivet tool to insert the rivet.

26. Use Slip-Eaze or a half-and-half soap and water solution to lubricate the biparting seal assembly (7). Install the biparting seal by sliding it into the door edge. When correctly positioned, the door seal will be flush with to slightly below the top and bottom of the door skin.

27. Insert the panel cap (6) into the top edge of the door panel and install three flat head screws (5). Tighten the screws to 10 ± 1 inch pounds.

28. Align the roller bracket assembly (4) with the screw holes on the outside of the door panel. Attach the roller bracket assembly using two screws (1), two lockwashers (2), and two plain washers (3). Tighten the screws to 11 ± 1 foot pounds.

29. (Refer to Figure 4-2.13. Separating the Door Panels (Step 1)) Attach the center hinge and join the doors as described below.

30. Slide one tapping strip (12) between the biparting seal and the hinge door panel (11) inside skin. Align the screw holes.

31. Position the hinge (9) on the hinge door panel. Attach the hinge with 13 screws (7) and lockwashers (8). Tighten the screws to 20 ± 2 inch pounds.

32. Slide the second tapping strip (12) between the biparting seal and the center door panel (10) inside skin. Align the screw holes.

33. Position the center door panel with the hinge. Attach the hinge to the center door panel with 13 screws (7) and lockwashers (8). Tighten the screws to 20 ± 2 inch pounds.

34. Feed the pneumatic tubing from the center door panel through the transfer tube mounting hole. Feed the tubing through the transfer tubes (4 and 5) with integral alignment sleeve (6). Slide the transfer tubes together as an assembly.

35. Cut the tube that protrudes through the transfer tube port on the center door panel so there is approximately 2 to 3 inches of extra tube. Place a connector on the end of the tube.

36. Join the tubes by attaching the connector to the transfer tube from the center door panel.

37. Install the assembled transfer tubes and alignment sleeve on the door panels. Attach it with four screws (1), four lockwashers (2), and four plain washers (3). Tighten the screws to 23 ± 2 inch pounds.

b) Installation

Refer to Figure 4-2.3. Removing the Door Panels. Replace the door panels as described below.

1. Place the door bottom pivot into the pivot socket on the bottom rail in the door opening. Tip the door panels into the proper position, making sure the roller on the roller bracket is in the roller channel.
2. Install the mounting plate (10) and the bearing plate (9) over the stub shaft, and install the attaching hardware. Tighten the attaching hardware according to carbuilder standards.
3. Install the bearing assembly (8) and spacer (7) over the stub shaft.
4. Install the lever assembly (3) over the stub shaft. Install the locking wedges (5 and 6) and tighten the screw (4).
5. Connect the operating rod (2) to the lever assembly (3).
6. Connect the tube (1) that exits the door panels through the stub shaft to the sensitive edge switch on the door operator.
7. Adjust the connecting rod as necessary so that the doors close and lock correctly.

(B) Left Hand High Floor Door Assembly

The left-hand high floor door assembly is the mirror image of the right-hand high floor door assembly. Heavy maintenance of the left-hand high floor door assembly is identical to heavy maintenance for the right-hand high floor door assembly. Refer section 4-2.1.2.d (A)

(C) Right Hand Low Floor Door Assembly

a) Reassembly

- **Reference Information.**
  1. Tools / Equipment.
     – MBTA Overhaul Standard Tools Kit.
  2. Material (Not Applicable).
- **Procedure**

xv) Install Glass into Hinge Door Panel

Refer to Figure 4-2.20. Hinge Door Windows (Step 8). Install the door glass into the hinge door panel as described below.

1. If the lower inside window seal was not removed, proceed to Step 2, below. If the lower inside seal (6) was removed, install the lower inside seal (6) according to the following procedure.
2. Position the window seal at the top center of the window opening and press the window seal onto the inner door skin.
3. Press the bottom center of the window seal onto the door skin at the bottom center of the opening.
4. Press the window seal over the door skin, starting at bottom center and working upward evenly in both directions.

NOTE: The window seal must be completely and evenly seated around the circumference of the opening, and must not be stretched or bunched at any point.

5. Insert the lower window glass (4) from the outside surface of the door and position the lower window glass in the inside window seal.
6. Install the lower window outside window seal (5).
7. Start at the top center and press the window seal in place.
8. Then, press in the bottom center of the window seal, and feed the sides onto the door skin.
9. When the window seal has been fed completely onto the door skin, even and seat the window seal using a nylon block and rubber mallet. Position the block against the window seal so that striking the block with the mallet will seat the window seal around the door skin and lock the outside window seal to the inside window seal.
10. Check to make sure the outside window seal is seated and locked to the inside window seal. If both window seals are seated correctly and locked there will be no gaps between the window seal and the window glass. The outside window seal cannot be grasped and pulled away from the window by hand.
11. If the upper inside window seal was not removed, proceed to Step e, below. If the upper inside seal (3) was removed, install the upper inside seal (3) according to the following procedure.
12. Position the window seal at the top center of the window opening and press the window seal onto the inner door skin.
13. Press the bottom center of the window seal onto the door skin at the bottom center of the opening.
14. Press the window seal over the door skin, starting at bottom center and working upward evenly in both directions.

NOTE: The window seal must be completely and evenly seated around the circumference of the opening, and must not be stretched or bunched at any point.

15. Insert the upper window glass (1) from the outside surface of the door and position the upper window glass in the inside window seal.
16. Install the upper window outside window seal (2).
17. Start at the top center and press the window seal in place.
18. Then, press in the bottom center of the window seal, and feed the sides onto the door skin.
19. When the window seal has been fed completely onto the door skin, even out and seat the window seal using a nylon block and rubber mallet. Position the block against the window seal so that striking the block with the mallet will seat the window seal around the door skin and lock the outside window seal to the inside window seal.
20. Check to make sure the outside window seal is seated and locked to the inside window seal. If both window seals are seated correctly and locked there will be no gaps between the window seal and the window glass. The outside window seal cannot be grasped and pulled away from the window by hand.

xvi) Install Hinge Door Panel Bottom Edge Components

Refer to Figure 4-2.19. Bottom Edge Components (Step 7). Install the hinge door panel bottom edge components as described below.

1. Slide the pivot bracket (7) into the door bottom edge.
2. Align the tapped holes in the pivot bracket with the screw holes in the door panel inner skin. Insert three screws (6), and tighten the screws to 13 ± 1 foot pounds.
3. Install the kick panel (3) on the inner door skin. Attach the plate with five screws (1). Tighten the screws to 10 ± 1 inch pounds.
4. Install a new bottom seal (4) and the tapping pad (5), using four screws (2). Tighten the screws to 20 ± 2 inch pounds.

xvii) Install Hinge Door Panel Top Edge Components

Refer to Figure 4-2.18. Door Top Edge Components (Step 6). Install the hinge door panel top edge components as shown in, and as described below.

1. Use Slip-Ease or a solution of half soap and half water to lubricate the bi parting seal assembly (11). Install the bi parting seal by sliding it into the

door edge. When correctly positioned, the door seal will be flush with to slightly below the top and bottom of the door skin.

2. Insert a six-foot length of new tubing (7) through the transfer tube hole and into the top of the door cavity. Tape the end of the tubing to the outside of the door skin where it enters the door cavity through the transfer tube hole to prevent it from being lost inside the door cavity.
3. Feed the tubing (7) through the bottom of the stub shaft and bracket (9) and out the top of the stub shaft. Tape the tubing to the stub shaft and bracket.
4. Slide the stub shaft and bracket (9) into the door top edge.
5. Align the tapped holes in the stub shaft and bracket with the screw holes in the door panel inner skin. Insert four screws (10), and tighten the screws to 11 ± 1 foot pounds.
6. Feed the tubing end from the stub shaft and bracket through the stub shaft hole on the panel cap (1).
7. Insert the panel cap into the top edge of the door panel and install three flat head screws (3) and one screw (2). Tighten the screws to 11 ± 1 inch pounds.
8. Install the bumper (6), using one screw (4) and one washer (5). Tighten the screw securely without deforming the bumper.

xviii) Install Door Glass Into Center Panel

Refer to Figure 4-2.17. Center Door Panel Windows (Step 5). Install the door glass into the center door panel as described below.

1. If the lower inside window seal was not removed, proceed to Step b, below. If the lower inside seal (6) was removed, install the lower inside seal (6) according to the following procedure.
2. Position the window seal at the top center of the window opening and press the window seal onto the inner door skin.
3. Press the bottom center of the window seal onto the door skin at the bottom center of the opening.
4. Press the window seal over the door skin, starting at bottom center and working upward evenly in both directions.

NOTE: The window seal must be completely and evenly seated around the circumference of the opening, and must not be stretched or bunched at any point.

5. Insert the lower window glass (5) from the outside surface of the door and position the lower window glass in the inside window seal.
6. Install the outside window seal (4).

7. Start at the top center and press the window seal in place.
8. Then, press in the bottom center of the window seal, and feed the sides onto the door skin.
9. When the window seal has been fed completely onto the door skin, even and seat the window seal using a nylon block and rubber mallet. Position the block against the window seal so that striking the block with the mallet will seat the window seal around the door skin and lock the outside window seal to the inside window seal.
10. Check to make sure the outside window seal is seated and locked to the inside window seal. If both window seals are seated correctly and locked there will be no gaps between the window seal and the window glass. The outside window seal cannot be grasped and pulled away from the window by hand.
11. If the upper inside window seal was not removed, proceed to Step 5, below. If the upper inside seal (3) was removed, install the upper inside seal (3) according to the following procedure.
12. Position the window seal at the top center of the window opening and press the window seal onto the inner door skin.
13. Press the bottom center of the window seal onto the door skin at the bottom center of the opening.
14. Press the window seal over the door skin, starting at bottom center and working upward evenly in both directions.

NOTE: The window seal must be completely and evenly seated around the circumference of the opening, and must not be stretched or bunched at any point.

15. Insert the upper window glass (2) from the outside surface of the door and position the upper window glass in the inner window seal.
16. Install the outside window seal (1).
17. Start at the top center and press the window seal in place.
18. Then, press in the bottom center of the window seal, and feed the sides onto the door skin.
19. When the window seal has been fed completely onto the door skin, even and seat the window seal using a nylon block and rubber mallet. Position the block against the window seal so that striking the block with the mallet will seat the window seal around the door skin and lock the outside window seal to the inside window seal.
20. Check to make sure the outside window seal is seated and locked to the inside window seal. If both window seals are seated correctly and locked there will be no gaps between the window seal and the window glass.

The outside window seal cannot be grasped and pulled away from the window by hand.

xix) Install Center Door Bottom Edge Components

Refer to Figure 4-2.18. Bottom Edge Components (Step 4) Install the center door bottom edge components as described below.

1. Install the kick plate (5) with five screws (8), tightening the screws to 10 ± 1 inch pounds.
2. Install the tapping pad (7) and bottom seal (6) using three screws (9). Tighten the screws to 20 + 2 inch pounds.
3. Install the guide bracket (1) with four washers (4), four lockwashers (3), and four screws (2). Tighten the screws to 11 ± 1 foot pounds.

xx) Install Sensitive Edge

Refer to Figure 4-2.15. Door Center Panel Sensitive Edge Assembly (Step 3). Install the sensitive edge assembly as described below.

1. Install a six-foot length of tubing (4)) through the port in the door skin for the transfer tube assembly. Leave approximately two inches of tube protruding through the transfer tube port. Tape the end to the door so it cannot be pulled into the door.
2. Feed the free end of the tube through the hole in the edge of the door for the tube from the sensitive edge assembly.
3. Install a connector (5) over one end of the tubing (4).
4. Install the connector over the tube on the sensitive edge (3).
5. If necessary, coat the sensitive edge with Slip-Eaze or a half-and-half solution of dish soap and water, which will provide lubrication while the sensitive edge is being slid into the slot.
6. Position the sensitive edge so its protruding tube will enter the hole in the door edge.
7. Push the sensitive edge into the slot. The sensitive edge is correctly positioned when it is flush with to slightly inside the top and bottom surfaces of the door panel, and the protruding tube sticks straight into the door.
8. Make sure the screw holes are properly aligned, and install the edge retainer (2) with 14 flat head screws (1). Tighten the screws to 13 ± 1 inch pounds.
9. Pull the taped end of the tube through the transfer tube hole until there is approximately two inches of extra tubing in the door interior.

xxi) Install Door Center Panel Upper Edge Components

Refer to Figure 4-2.14. Door Center Panel Upper Edge Components (Step 2). Install the door center panel upper edge components as described below.

1. Install the bumper (11), using one screw (12) and one lockwasher (13). Tighten the screw securely, but do not deform the bumper
2. Use Slip-Eaze or a half-and-half soap and water solution to lubricate the biparting seal assembly (7). Install the biparting seal by sliding it into the door edge. When correctly positioned, the door seal will be flush with to slightly below the top and bottom of the door skin.
3. Insert the panel cap (6) into the top edge of the door panel and install three flat head screws (5). Tighten the screws to 10 ± 1 inch pounds.
4. Align the roller bracket assembly (4) with the screw holes on the outside of the door panel. Attach the roller bracket assembly using two screws (1), two lockwashers (2), and two plain washers (3). Tighten the screws to 11 ± 1 foot pounds.

xxii) Attach Center Hinge and Join Doors

Refer to Figure 4-2.13 Separating the Door Panels (Step 1). Attach the center hinge and join the doors as described below.

1. Slide one tapping strip (12) between the biparting seal and the hinge door panel (11) inside skin. Align the screw holes.
2. Position the hinge (9) on the hinge door panel. Attach the hinge with 13 screws (7) and lockwashers (8). Tighten the screws to 20 ± 2 inch pounds.
3. Slide the second tapping strip (12) between the biparting seal and the center door panel (10) inside skin. Align the screw holes.
4. Position the center door panel with the hinge. Attach the hinge to the center door panel with 13 screws (7) and lockwashers (8). Tighten the screws to 20 ± 2 inch pounds.
5. Feed the pneumatic tubing from the center door panel through the transfer tube mounting hole. Feed the tubing through the transfer tubes (4 and 5) with integral alignment sleeve (6). Slide the transfer tubes together as an assembly.
6. Cut the tube that protrudes through the transfer tube port on the center door panel so there is approximately 2 to 3 inches of extra tube. Place a connector on the end of the tube.
7. Join the tubes by attaching the connector to the transfer tube from the center door panel.

8. Install the assembled transfer tubes and alignment sleeve on the door panels. Attach it with four screws (1), four lockwashers (2), and four plain washers (3). Tighten the screws to 23 ± 2 inch pounds.

b) Installation

Installation of Right Hand Low Floor Door Assembly as follows

Refer to Figure 4-2.12. Removing the Door Panels. Replace the door panels as described below.

1. Place the door bottom pivot into the pivot socket on the bottom rail in the door opening. Tip the door panels into the proper position, making sure the roller on the roller bracket is in the roller channel
2. Install the mounting plate (10) and the bearing plate (9) over the stub shaft, and install the attaching hardware. Tighten the attaching hardware according to carbuilder standards.
3. Install the bearing assembly (8) and spacer (7) over the stub shaft.
4. Install the lever assembly (3) over the stub shaft. Install the locking wedges (5 and 6) and tighten the screw (4).
5. Connect the operating rod (2) to the lever assembly (3).
6. Connect the tube (1) that exits the door panels through the stub shaft to the sensitive edge switch on the door operator.
7. Adjust the connecting rod as necessary so that the doors close and lock correctly**.**

(D) Left Hand Low Floor Door Assembly

The left-hand low floor door assembly is identical in structure to the right-hand low floor door assembly. Heavy maintenance of the left-hand low floor door assembly is identical to heavy maintenance for the right-hand low floor door assembly. Refer to section 4-2.1.2.d (C)

4-2.1.2.i Adjustment/Test

a) Adjustment

i) Door Alignment – Closed Position

Before attempting to adjust the door alignment, verify that all adjustable components are mounted in their nominal positions. These components include:

- Sub shaft and bracket assembly – in the center of the bearing bracket openings
- Lower pivot brackets – approximately centered
- Bottom stabilizing wedge brackets – approximately centered
- Upper roller brackets – approximately centered
- Guide tracks – approximately centered
- Center door threshold brackets – in the lowest position
- End door threshold brackets – approximately centered

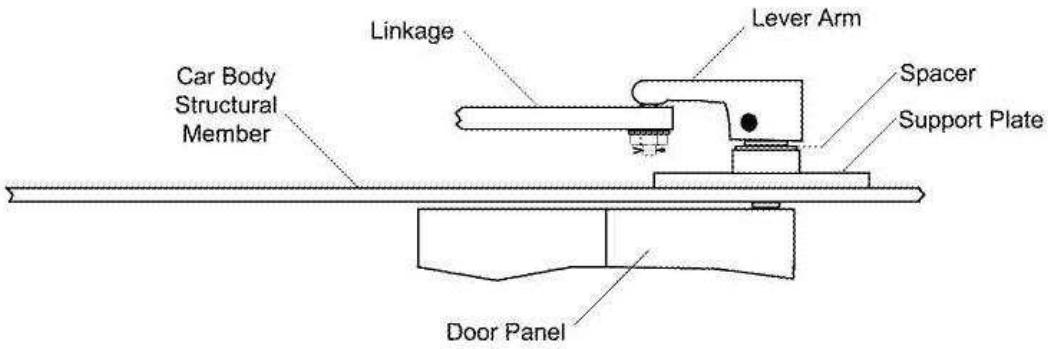

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Figure 4-2.21. Panel Spacer

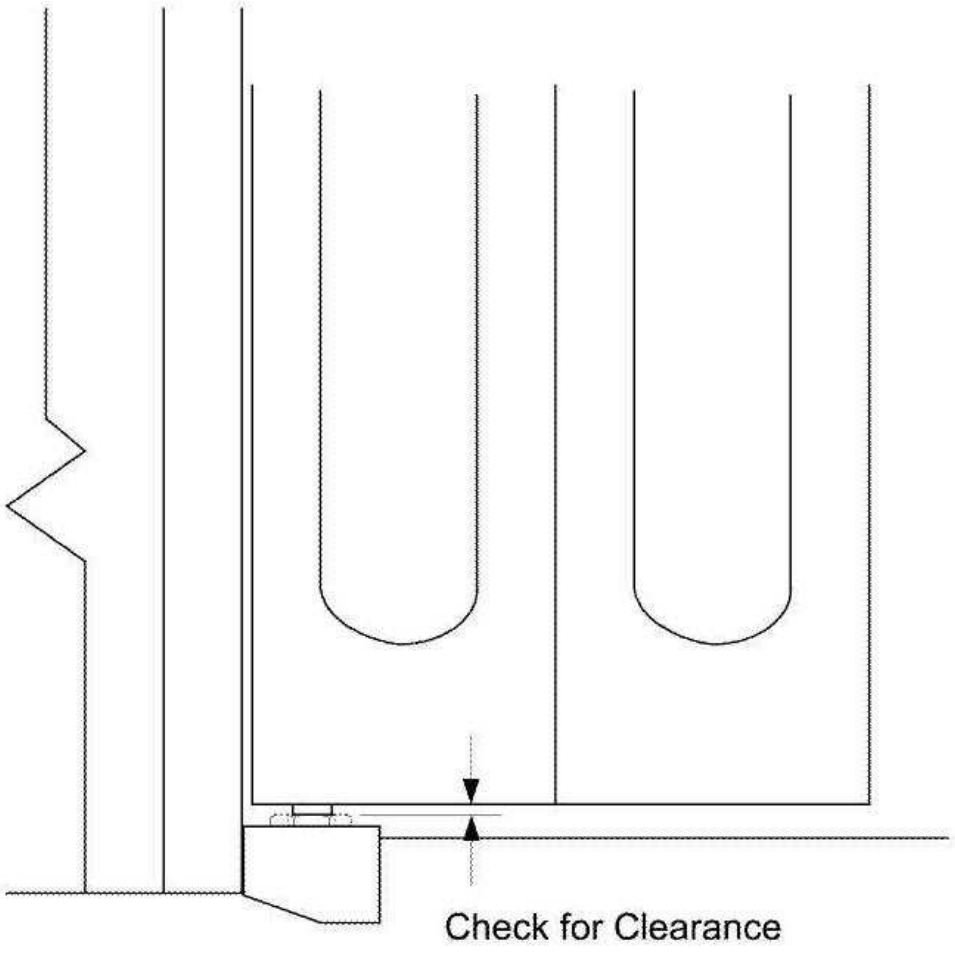

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Figure 4-2.22. Bottom Clearance

NOTE: **The maximum allowable height difference between two adjacent panels is 0.187" (3/16"). If two adjacent panels present a bigger height difference, add a round spacer (one spacer is already installed), (VRI P/N 56810305-12), on the lowest panel (for location see Figure 4-2.21) Also check that there is clearance between the bottom of the door panel and the hex-head of the pivot bracket. Refer to Figure 4-2.22.**

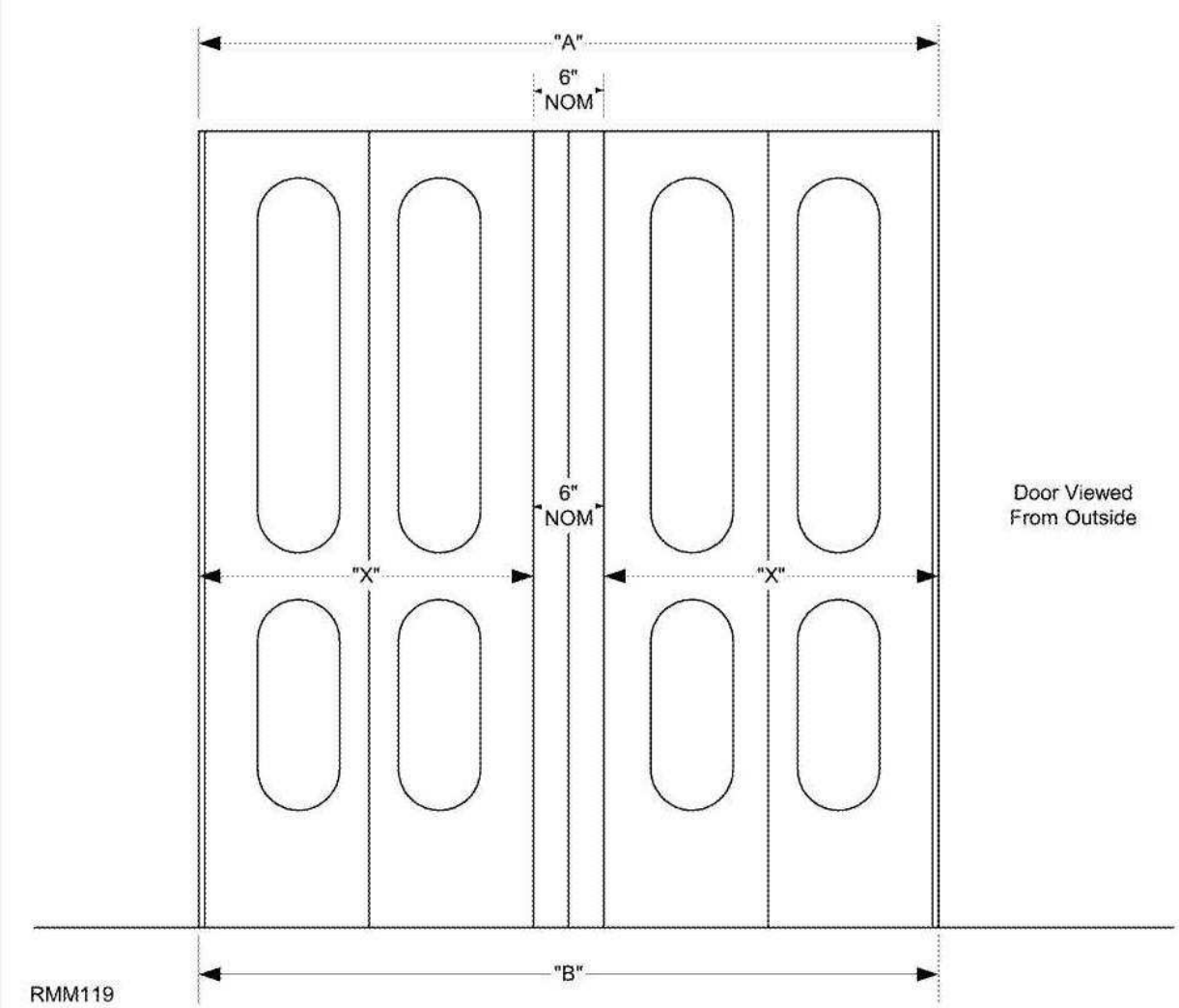

Figure 4-2.23. Door Opening Width

1. Manually place the teeter lever in the locked over center position (door closed and locked).
2. On the outside of the car, measure the width at the top of the door opening (refer to Figure 4-2.23), dimension “A”). Subtract 6 inches and divide by 2 (X = (A-6”)/2).
3. Adjust the door panel so that the distance from the metal leading edge to its respective portal edge at the top of the opening is the same as the distance calculated above (“X”).

To adjust for the correct gap on the top, loosen the four nuts securing each bearing plate to the header extrusion. Move the bearing plate or plates as required in the forward/aft directions. The panels may be opened slightly, for easier adjustment.

4. Secure the mounting fasteners and verify the gap at the top. Re-adjust as required.

5. On the opposite side, close and lock the door panel. Adjust this panel so that the metal leading edge is at the same distance from its respective portal edge at the top of the opening as the one on the opposite side.

6. Close and lock both panels and measure the distance between the metal leading edges of the door panels at the top. It should be between 5-15/16 in. and 6-1/16 in. If not, than readjust the door panels so that this distance is between 5-15/16 in. and 6-1/16 in. This adjustment should be evenly distributed between both panels.

7. The point where the rubber leading edge seals meet will not be in the exact center of the clear door opening. On the outside of the car measure the width of the bottom of the clear door opening (Refer to Figure 4-2.23 dimension “B”). Subtract 6 inches and then divide by 2.

8. Close and lock the door panel. To adjust the gap at the bottom, loosen the bottom pivot mounting nut and position the pivot as required, in the forward/aft direction. The panels may be opened slightly for easier adjustment. Secure the mounting nut after verifying the gap adjustment.

9. On the opposite side, close and lock the panel. Use the same procedure as previously described to set the panel metal leading edge at the same distance from its respective portal edge at the bottom of the opening as the opposite side.

10. Close and lock both panels and measure the distance between the metal leading edges of the door panels at the bottom. It should also be between 5-15/16 in. to 6-1/16 in. If not, then readjust the door panels so that this distance is between 5-15/16 in. to 6-1/16 in. This distance should be the same along the entire length of the door panel. (The distance from portal edge to metal leading edge should be the same for both panels at the top and the same for both panels at the bottom. The distance from portal edge to metal leading edge at the top may be different from the distance at the bottom for the same door panel due to variances in the car portal opening.)

11. Manually place the teeter lever in the locked over center position (Door closed and locked). Measure the distance at the top, center, and bottom of the opening between the door panel leading edges (metal). This distance should be 6.00 ± .06 inches (152.4 ± 1.5 mm).

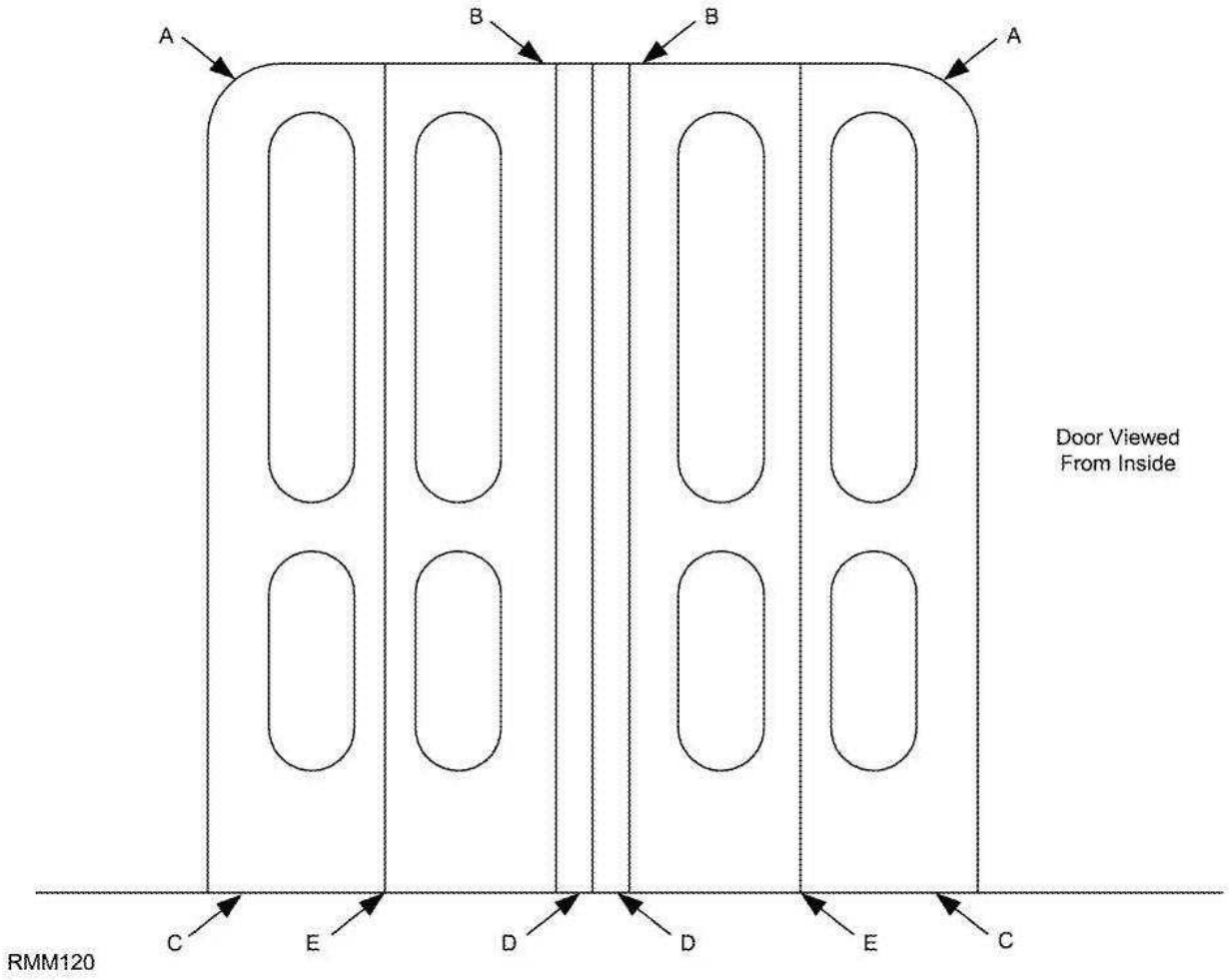

Figure 4-2.24. Top Seals Contact

12. Check the top seals contact between the inside surface of the door panels and the seal itself.

13. To check the contacts use a gauge (plastic or metallic tool with dimensions 2” x 3” x 0.015 inches). The working side of the tool is 2” X 0.015”. The rubber gasket should be compressed to the point where some resistance is felt but before the plastic / metallic tool starts to bend.

14. To adjust the upper corner seal gap loosen the four nuts, securing each bearing plate to the header extrusion. Move the bearing plate or plates, as required in the inboard/outboard directions. Tighten the mounting fasteners and verify the seal gap(s) at the top corners of the opening only (refer to location A in Figure 4-2.24).

15. Check an area 5.0” from the top corners of the opening to the center of the top opening. Readjust, as required.

16. Perform a visual inspection to confirm the integrity of the top bearing plate gasket. Change the gasket if it is damaged.
17. After setting the correct gap, torque the bearing plate(s) mounting hardware to 19 ft-lbs.
18. To adjust the face seal gap(s) at the top center of the opening, loosen the guide track(s) mounting hardware.
19. Loosen all mounting nuts except those at the corner(s) of the door.
20. Pivot the guide track(s) in the inboard/outboard direction to achieve the compressed value. To check the compression of the gasket, use the gauge (plastic or metallic tool) (refer to location B in Figure 4-2.24).
21. After the adjustment is made, torque the mounting hardware to 19 ft-lbs.
22. Manually open and close the doors three times to check the interface between the door center seals (top sensitive edge seals) and the seal transition mounted at the top center of the module frame opening.
23. Verify that the center seals (top sensitive edge seals) do not rub hard against the transition piece during closing. If there is excessive contact between the door seals and the transition piece, readjust the guide track position to minimize this condition.
24. Verify that in the closed position, the seals sit flush against the transition piece. Check for proper roller guide bracket brush seal vertical position. If the brush seal is over compressed, readjust it to obtain a minimum pressure on the brush (the brush must barely touch the door panel top, except for the roller bracket, where the brush compression can be higher).
25. To adjust the face seal gap(s) at the bottom of the opening, loosen the bottom pivot mounting nut (s), and position the pivot (s), as required, in the inboard/outboard directions. The panels may be closed and locked for ease of adjustment.
26. Tighten the mounting nut(s) and check the gap(s) at the bottom corners of the opening (refer to location C in Figure 4-2.24). Re-adjust as required.
27. Torque the pivot mounting nuts to 38 ft-lbs. after verifying the gap adjustments. Ensure that the previous adjustments are kept (If not, repeat all the previous steps).
28. Manually place the teeter lever in the locked over center position (Door closed and locked).
29. Check that the bottom seals contact the edge of the threshold at the center of the opening. If there is a gap in this area, loosen the two 1/4-20 UNC flat head screws securing the stabilizing wedge to the threshold. Move the wedge inboard until the seals compress against the edge of the threshold.

30. To check the compression of the bottom seals, use the same gauge (plastic or metallic tool) used to check the top gasket compression (refer to location D in Figure 4-2.24).Try to push the gauge (plastic or metallic tool) in between the threshold and the bottom seal. The seal should be compressed enough to feel the resistance but does not bend the gauge (plastic or metallic tool). Do not over compress the seal.

31. Torque the screws to 5 ft.-lbs. after completing adjustment. Manually open and close each door set and verify that the bottom guide brackets engage the wedge properly without any binding.

32. Verify that the doors close without excessive rubbing of the lower seals on the threshold. If there is excessive rubbing or binding (or both), readjust the wedge position further outboard. Ensure that the previous adjustments are kept (If not repeat all the previous steps).

33. Before starting this step do steps 1 to 28. The threshold brackets have over-sized holes to allow adjustment in the left/right directions for end door and left/right, up/down direction for center doors. The starting position for the door brackets is in their lowest position for the central door panels and in the middle position for the end doors panels.

34. Loosen the four bolts holding the threshold brackets to the door panel and adjust each bracket to the correct position.

35. At the central doors: check that the threshold brackets engage the threshold wedge as the doors close and raise them if necessary to obtain engagement while ensuring that they do not interfere on the threshold. When adjusting these threshold brackets try to obtain an adjustment that will produce engagement of both brackets in the wedge at the same time such that the doors are pulled together in line with each other.

36. Finally, check the plastic end of the threshold brackets are not touching / have some clearance to the bridge-plate cover. The end door threshold brackets are moved longitudinally to obtain simultaneous engagement of the threshold wedge to pull the panels together in line with each other.

37. After the threshold brackets are in place, torque the mounting bolts to 19 ft-lbs. Repeat step 28.

ii) Door Alignment – Open Position

1. Refer to Figure 4-2.25 Manually move each panel set to the open position. Disconnect the connecting rods from the teeter lever and the door shaft levers. To disconnect the connecting rod from the door shaft lever, the panel must be lifted. Take the necessary measures to prevent any scratches, panel damage, or other incidents. All the hardware removed during this operation must be replaced with new hardware (Locking devices, washers).

2. Open each panel set until the bumper on the driver panel makes contact with the driven panel.

3. In this position, the driver panel should be at approximately 90° to the plane of the door opening. If not, loosen the four bolts securing the roller guide bracket to the door panel. Adjust the roller guide position until the driver panel reaches the 90° position. Verify that the stops are touching at this point.

4. Refer to Figure 4-2.25, Try to close the doors manually from the full open position (bumpers touching) by turning the door shaft lever manually. Some resistance will be encountered prior to the start of motion. Using a clamp, pull or push the panel leading edge with a Force Gauge. The force necessary to move the disconnected panel must be less than 15 lbs. If the panels do not move, adjust the position of the roller bracket slightly closer to the edge of the leading edge seal and retry closing the doors. This adjustment may cause the driver panel to open more than 90°.

5. Torque the roller bracket assembly mounting hardware to 19 ft-lbs. after verifying the adjustment.

6. Place both panel sets in the full open position (bumper stops touching) and verify the clear opening width by measuring between the edges of the sensitive edge seals. The end door clear opening should be 42 inches (1067 mm) minimum and the center door clear opening should be 50 inches (1270 mm) minimum.

7. Make minor alterations to the clear opening by adjusting the roller bracket guides

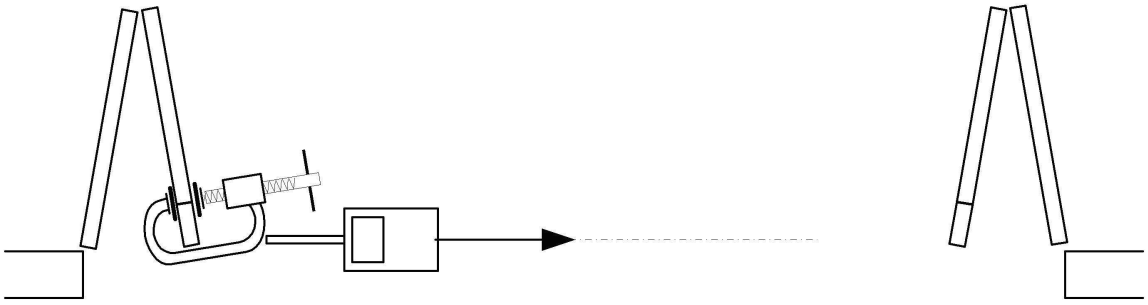

Figure 4-2.25. Door Alignment -Open

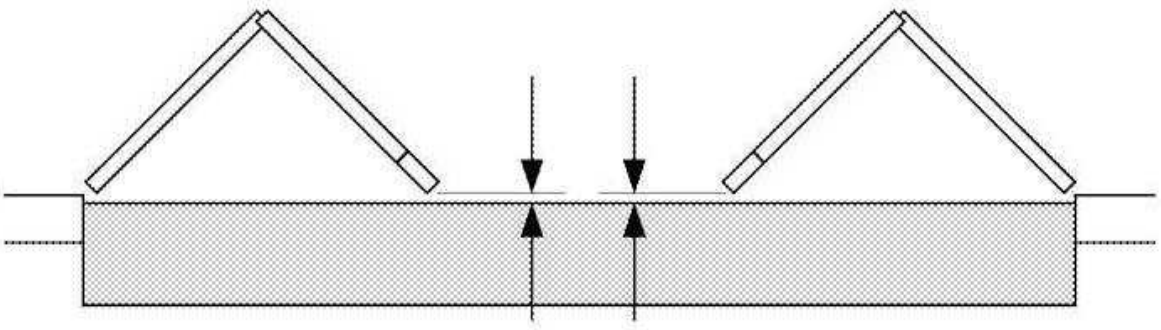

Figure 4-2.26. Sensitive Edge and Threshold Gap

8. After completing these adjustments, verify that the leading edge of the sensitive edge does not rub against the threshold as the doors open and close. There should be a minimum gap of 0.19 inches (4.8 mm) between the sensitive edge seals and the edge of the threshold when the roller guides are in the straight sections of the guide tracks (refer to Figure 4-2.26). Make minor alterations to this gap by adjusting the roller bracket assemblies.

iii) Door Panel Sensor Adjustment

1. Place the doors in the fully closed and locked position.
2. Place a 0.060" to 0.100" shim on the top surface of the roller bracket assembly directly beneath the sensing face of the panel sensor.
3. Loosen the panel sensor bracket mounting hardware and lower the sensor assembly until the sensor face makes contact with the shim.
4. Torque the sensor bracket mounting hardware to 19" inch-pounds and secure adjustment.
5. Remove the shim and verify the gap using a feeler gauge. As an example using a 0.09 inch shim, a 0.08-inch feeler gauge should be GO and a 0.1-inch feeler gauge NO GO

b) Test

i) On-Car Testing

On-car testing of the door assemblies is part of the test of the door system. No separate tests are required..

ii) Door System Test Procedures

a) Instrumentation

The following items are required to functionally test each door module assembly:

- Variable power supply
- Test fixture (if available) to support door module assembly
- Flat solid bar measuring 0.38 inch (9.5 mm) thick and 3 inches (76 mm) wide
- A 0.75 inch (19 mm) diameter solid rod
- PTU (Portable Test Unit) (refer to Maintenance Manual for procedures)

b) Pretest Preparation

NOTE: Follow this step only if the train is without power

1. Attach the module assembly and the stabilizing fixture to the test stand.
2. Connect variable power supply to the door control module. Set voltage to 37.5 volts.
3. Manually open and close the doors. Verify that the doors move freely without any binding or interference with test fixture.

c) Door Open and Close Speed Check *

1. Place doors in the fully closed and locked position.
2. Command the doors to open and measure the time.
3. Verify that the time required for the doors to reach their full open position is 2.5 ± 0.2 seconds.
4. With the doors in the full open position, command the doors to close and measure the time.
5. Verify that the time required for the doors to reach their fully closed position is 3.0 ± 0.2 seconds.
6. Set the variable power supply voltage to 24 VDC and repeat above steps.

iii) Obstruction Detection Test

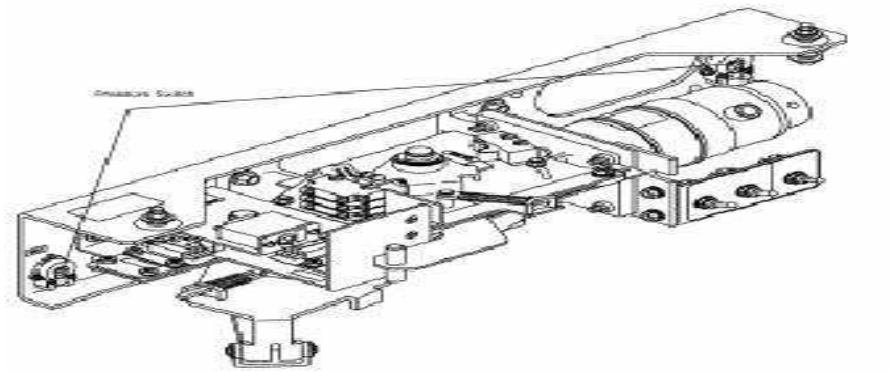

Figure 4-2.27. Pressure Switch

1. Open the doors, and command the doors to close. As the doors begin to close insert the 3 X 3/8 inch (76 x 9.5 mm) test bar (so that the 3 " face of the flat bar meets the door panel edge) along the line where the door panel edges mesh. Insert the test bar anywhere along the length of the edges except for the upper most 3 inches (76-mm) and lower most 1 inch (25-mm) of the door panel edge. Repeat this three times at locations near the top, middle, and bottom.
2. The doors should recycle open after encountering the obstruction. Repeat above steps using the 0.75 inch (19 mm) diameter test bar
3. Check for proper sensitivity of the sensitive edge (Left and Right). To obtain the proper obstruction detection turn the pressure wave switch knob left or right (refer to Figure 4-2.27). Adjust the pressure wave switch knob until the proper sensitivity is achieved (previous steps are passed). With the door panels open, push the close button and apply a small amount of pressure on the sensitive edge of each door panel or use the gauge block described in the previous steps to ensure that the pressure wave switch of each door leaf functions as intended. (Do not disconnect any of the pressure wave switches to test obstruction detection and verify a "single point failure").
4. Adjust the pressure wave switch as follows (only tool required is a screwdriver):
5. If it is too sensitive, (the door recycles without an obstruction), decrease the sensitivity of the pressure wave switch by turning clockwise with a screwdriver for approximately one-quarter turn.

6. If it is not sensitive enough, (the pressure wave switch does not detect one of the specified obstacles), increase the sensitivity of the pressure wave switch by turning counter clockwise with a screwdriver for approximately one-quarter turn.
7. If necessary repeat previous two steps.
8. Measure the force applied by the doors on an obstruction with the sensitive edges functioning. To do this, first command the doors to open. Place a force gauge (approximately 9" to 10" in overall length) at the center of the opening. The shaft end of the force gauge should have a 1" x 1" (25 x 25 mm) block attached to it. Command the doors to close against the force gauge. One door will strike the square block and the other will strike the opposite end of the force gauge. Position the force gauge so that the doors strike the gauge simultaneously.
9. The maximum force measured should not exceed 35 lb

4-2.1.3 Door Operator Assembly

4-2.1.3.a Door Operator Assembly

Each vehicle is equipped with six door operators, one for each Door Module assembly. The door operators are installed on the door module header extrusion directly above the door openings. Each Door Operator is protected through an hinged access cover panel.

The door operator consists in the following main components (Refer to Figure 4-2.28) mounted together on a formed sheet metal baseplate:

- Motor and gear housing;
- Manual release mechanism;
- Door out-of-service mechanism.

The door operator is installed directly on the door module header extrusion.

Figure 4-2.28 Door Operator Assembly

The door operator unlocks and opens / closes / locks the vehicle doors through its 4-bar linkage system (Refer to Figure 4-2.29). The motor and gearbox drives a pivoting teeter plate. The teeter plate connects to the door operating levers through adjustable connecting rods. When the door operator closes the door, the teeter plate moves the linking shafts to the overcenter position, which locks the doors and actuates the door locked switch. At the DOOR CLOSED position, the roller brackets actuate the door close proximity sensors that provide DOOR CLOSED signals to the door controller. When both signals are present, the controller verifies the DOOR CLOSED AND LOCKED condition.

The doors can only be opened by driving the teeter plate in the reverse direction and moving the connecting rods from the overcenter position. In normal operation this is done by the motor. In emergency operation this is done through one of the emergency release mechanisms

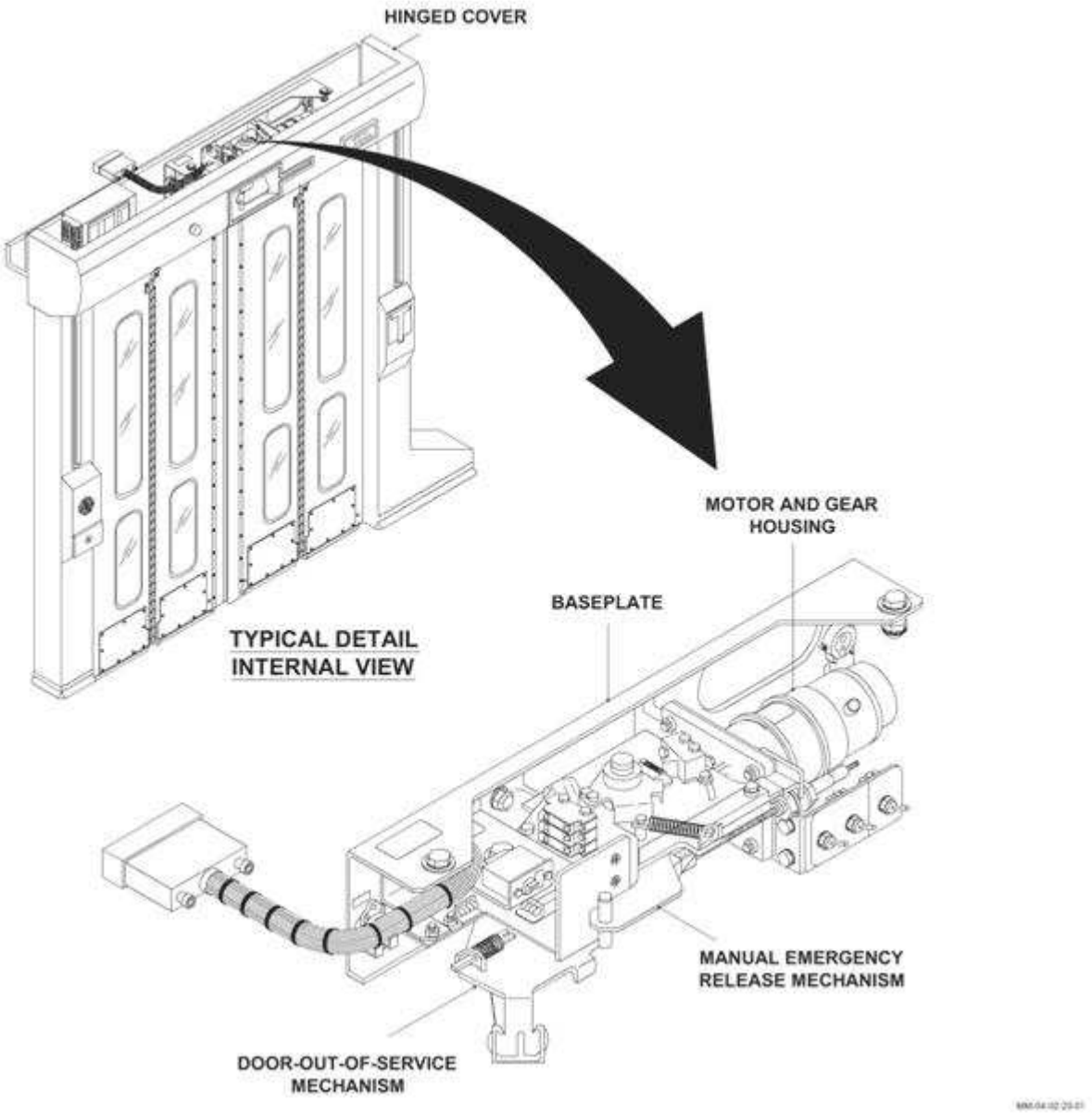

Figure 4-2.28 Door Operator Assembly

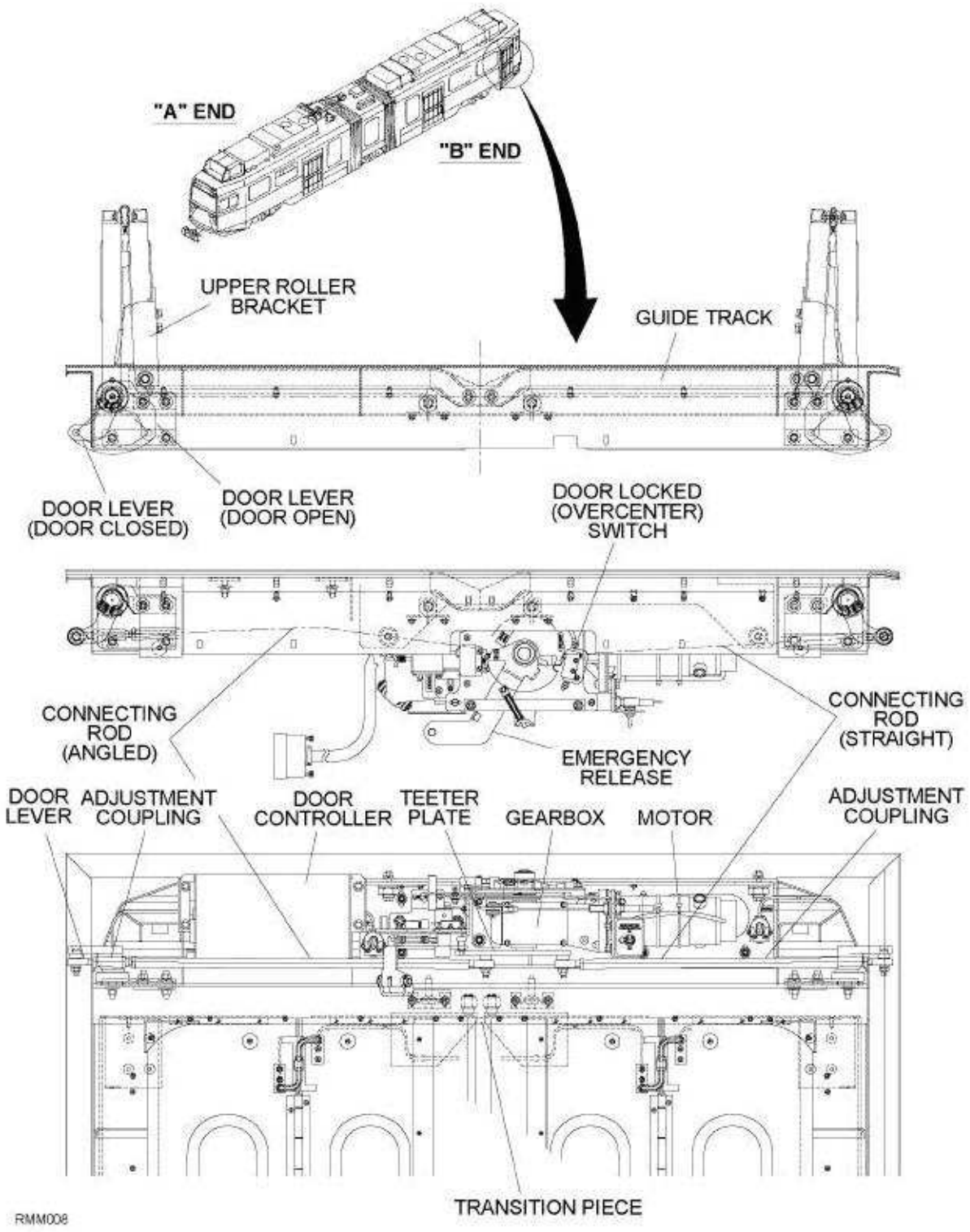

Figure 4-2.29 Door Operator Linkage

4-2.1.3.b Specific Safety Precautions

For Specific Safety Precautions refer 4-2.b

4-2.1.3.c Fault/Isolation

Refer 4-2.c for fault/Isolation of Door Operator

4-2.1.3.d Disassembly

- **Reference Information.**
  1. Tools / Equipment.
     – MBTA Overhaul Standard Tools Kit.
  2. Material (Not Applicable).
- **Procedure**

Door Operator Assembly

The door operator and wiring harness assembly is removed from the car after the wiring harness is removed which is described below:

a) Removal of Door Operator and Wiring Harness

Refer to Figure 4-2.30, Door Control Module with Wiring Harness.

1. Disconnect the wiring harness (1) from the car wiring at the main connector.
2. Disconnect the manual release cable (2) as described below.
   a. Loosen the hex nuts (2A) clamping the cable assembly in the support bracket (3) and the cable mounting bracket (4).
   b. Remove the cotter pin (5) from the clevis pin (6). Pull the clevis pin from the clevis (2B) on the manual release cable (2). This frees four washers (7).
   c. Using a number 2 screwdriver, remove the screw (8) and the plain washer (9). This frees the cable support bracket (3).
   d. Remove the cable support bracket from the cable, and slip the cable from the cable mounting bracket (4).

WARNING:	**THE DOOR OPERATOR ASSEMBLY WEIGHS APPROXIMATELY 50 POUNDS. USE SUITABLE LIFTING AIDS SUCH AS A SLING AND CHAINFALL TO SUPPORT THE DOOR OPERATOR BEFORE REMOVING THE NUTS, LOCKWASHERS, AND PLAIN WASHERS THAT SECURE THE DOOR OPERATOR TO THE MOUNTING BARS.**

3. Remove five hex nuts (10) and plain washers (11) from the mounting bars (12). Lift the door operator assembly (13) from the mounting bars.

4. Remove the mounting bars (12) from the car structure.

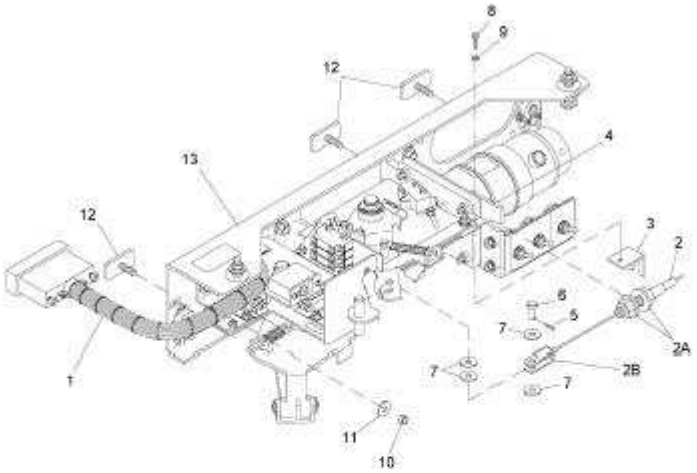

Figure 4-2.30. Door Operator with Wiring Harness

ITEM NO.	PART NAME	QTY	ITEM NO.	PART NAME	QTY
	Door Operator with Wiring Harness	Ref			
Figure 4-2.30 -1	Wiring Harness	1	-7	Plain Washer	4
-2	Manual Release Cable	1	-8	Screw	1
-2A	Cable Nut	2	-9	Plain Washer	1
-2B	Cable End Clevis	1	-10	Hex Nut	5
-3	Support Bracket	1	-11	Plain Washer	5
-4	Cable Mounting Bracket	Ref	-12	Mounting Bar	5
-5	Cotter Pin	1	-13	Door Operator	1
-6	Clevis Pin	1			

General Disassembly Instructions

During scheduled overhauls, remove and discard the following parts and replace them with new:

- attaching parts, except the attaching parts on switch terminals
- harness ties

b) Door Operator and Wiring Harness Disassembly Instructions

(Refer to Figure 4-2.31. Door Operator with Wiring Harness Removed)

Wiring Harness disassembly

Remove the wiring harness (1) from the door operator assembly as described below.

1. Locate and cut the nylon ties (2) securing the wiring harness to the door operator assembly. Do not cut the wiring harness wire bundling ties.

CAUTION: **"NOTE THE POSITIONING OF THE WIRING HARNESS AND THE PLACEMENT OF THE DOOR OPERATOR (2) THAT SECURE THE WIRING HARNESS TO THE DOOR OPERATOR .THESE HAVE BEEN ESTABLISHED TO PREVENT MECHANICAL INTERFERENCE BETWEEN THE WIRING HARNESS AND THE MOVING DOOR OPERATOR COMPONENTS". THIS ADVISES INSTALLER TO NOTE POSITION OF TIE WRAPS DURING REMOVAL TO USE SAME POSITIONS IN INSTALLATION, OR TO ADJUST IF NECESSARY, -SO AS NOT TO CAUSE INTERFERENCE. ONCE THE ORIGINAL POSITIONS HAVE BEEN NOTED DURING REMOVAL, THIS PROVIDES SUFFICIENT INFORMATION FOR THE INSTALLATION OF THE HARNESS.**

2. Disconnect each lead and tag it with the identity of the terminal from which it is removed.
3. Remove the wiring harness (1) from the door operator.

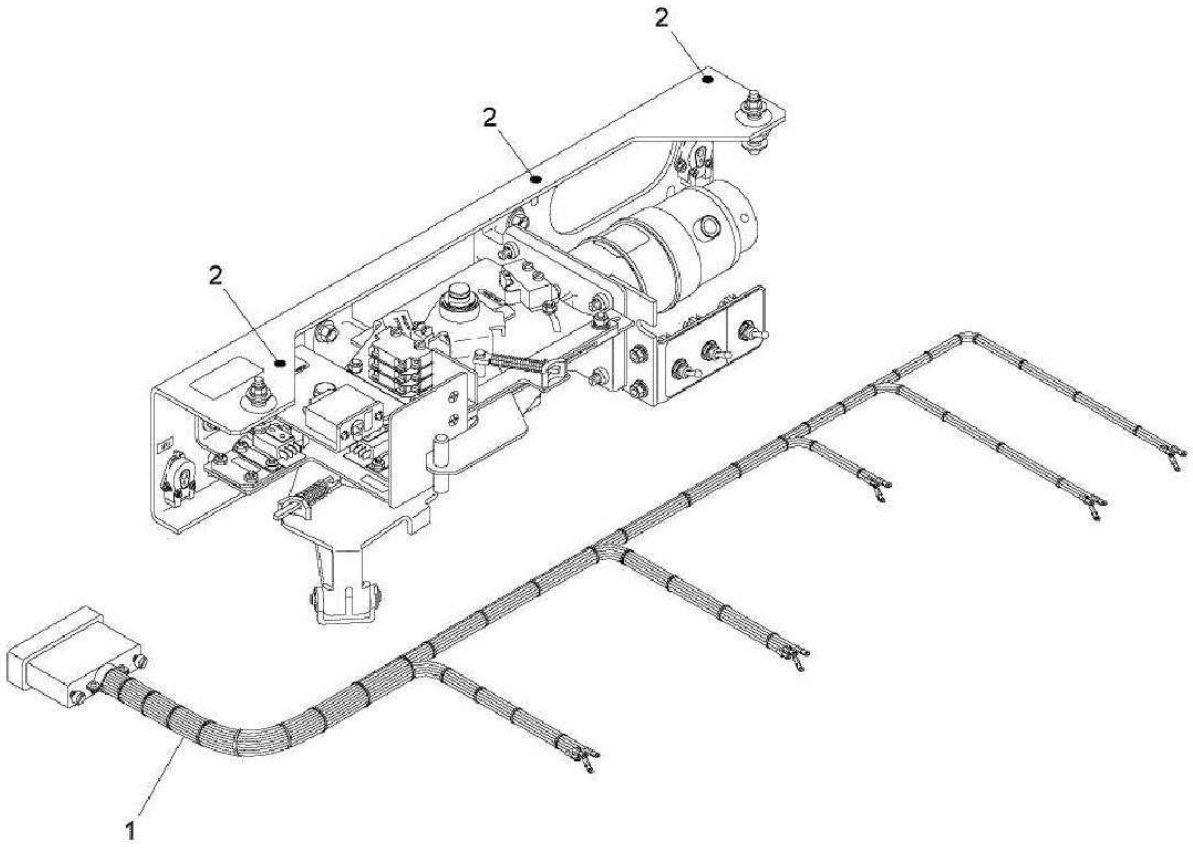

Figure 4-2.31. Door Operator with Wiring Harness Removed

ITEM NO.	PART NAME	QTY	ITEM NO.	PART NAME	QTY
	Door Operator with Wiring Harness	Ref			
1	Wiring Harness	1	2	Door Operator	

Door Operator Disassembly

General Disassembly Instructions

During scheduled overhauls, remove and discard the following parts and replace them with new:

- all attaching parts
- all springs
- all switches
- all retaining rings

Door Operator Disassembly procedure

i) Remove Switches

Refer to Figure 4-2.32. Door Operator EMS and Lever Switches. Remove switches EMS 1 and EMS 2 (3), and the lever switch (9) as described below.

1. Remove and discard two screws (1) and two washers (2). This frees three switches (3), and insulators (4) from the switch mounting plate (5).
2. Remove and discard two screws (6), two lockwashers (7), and two plain washers (8). This frees the lever switch (9) and the switch insulator (10) from the switch mounting plate (17).
3. Remove screws (11), washers (12), screw (13), washer (14), spacer (15), and insulating tubing (16) from the switch (9).

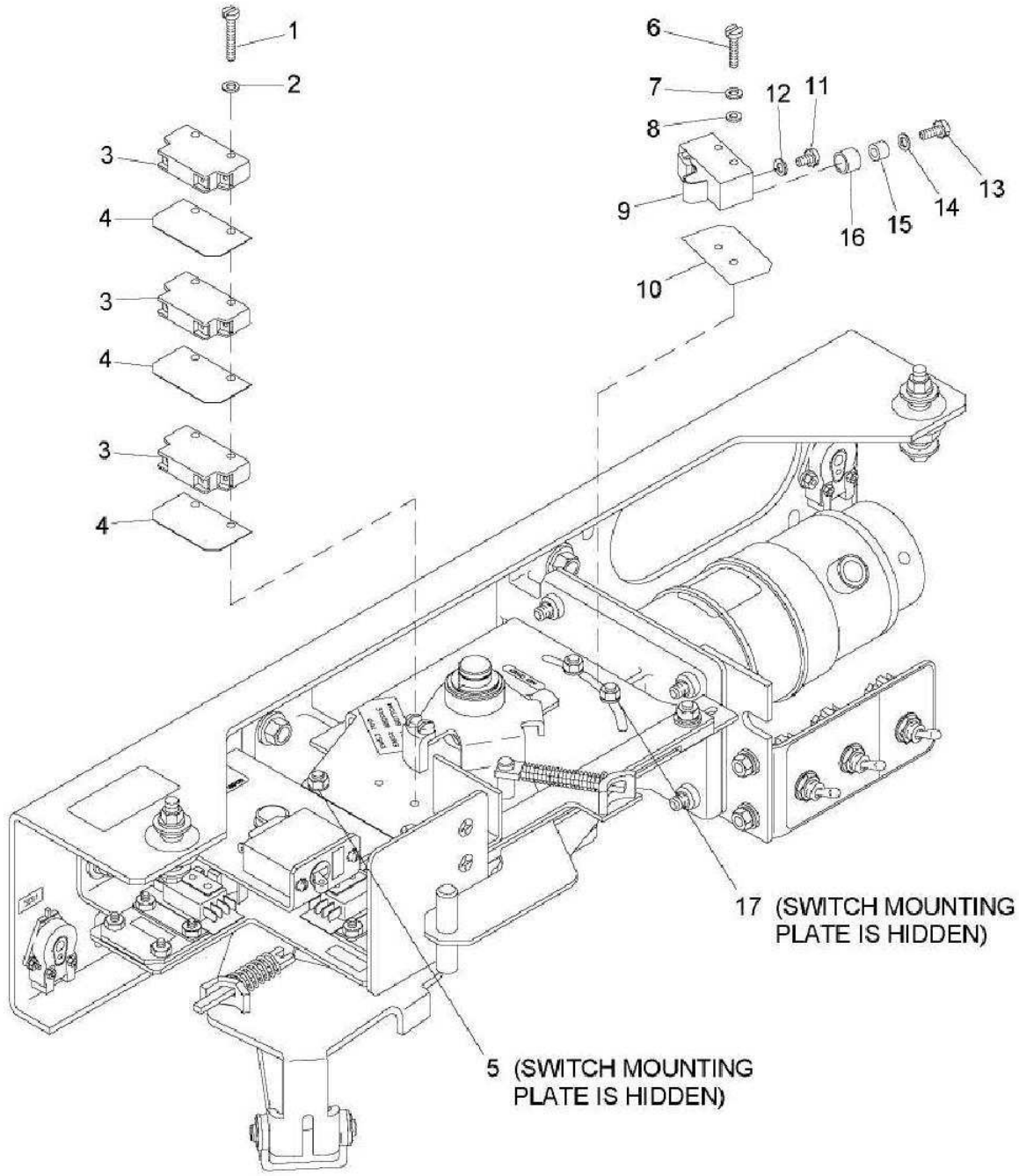

Figure 4-2.32. Door Operator EMS and Lever Switches

ITEM NO.	PART NAME	QTY	ITEM NO.	PART NAME	QTY
	Door Operator	Ref			
1	Pan Head Sem Screw	2	10	Switch Insulator	1
2	Plain Washer	2	11	Screw	3
3	Switch	3	12	Washer	3
4	Switch Insulator	3	13	Screw	1
5	Switch Mounting Plate	Ref	14	Washer	1
6	Pan Head Screw	2	15	Spacer	1
7	Lockwasher	2	16	Insulating Tubing	1
8	Plain Washer	2	17	Switch Mounting Plate	Ref
9	Lever Switch	1			

ii) Power Switches

Refer to Figure 4-2.33. Door Operator Power Switches. Remove the door power and bridgeplate power switches as described below.

1. Remove and discard lock nut (1) and locking ring (2) from the front of each switch (3). This frees the switches.
2. Remove the switches by pulling them from the back of the switch bracket (4).

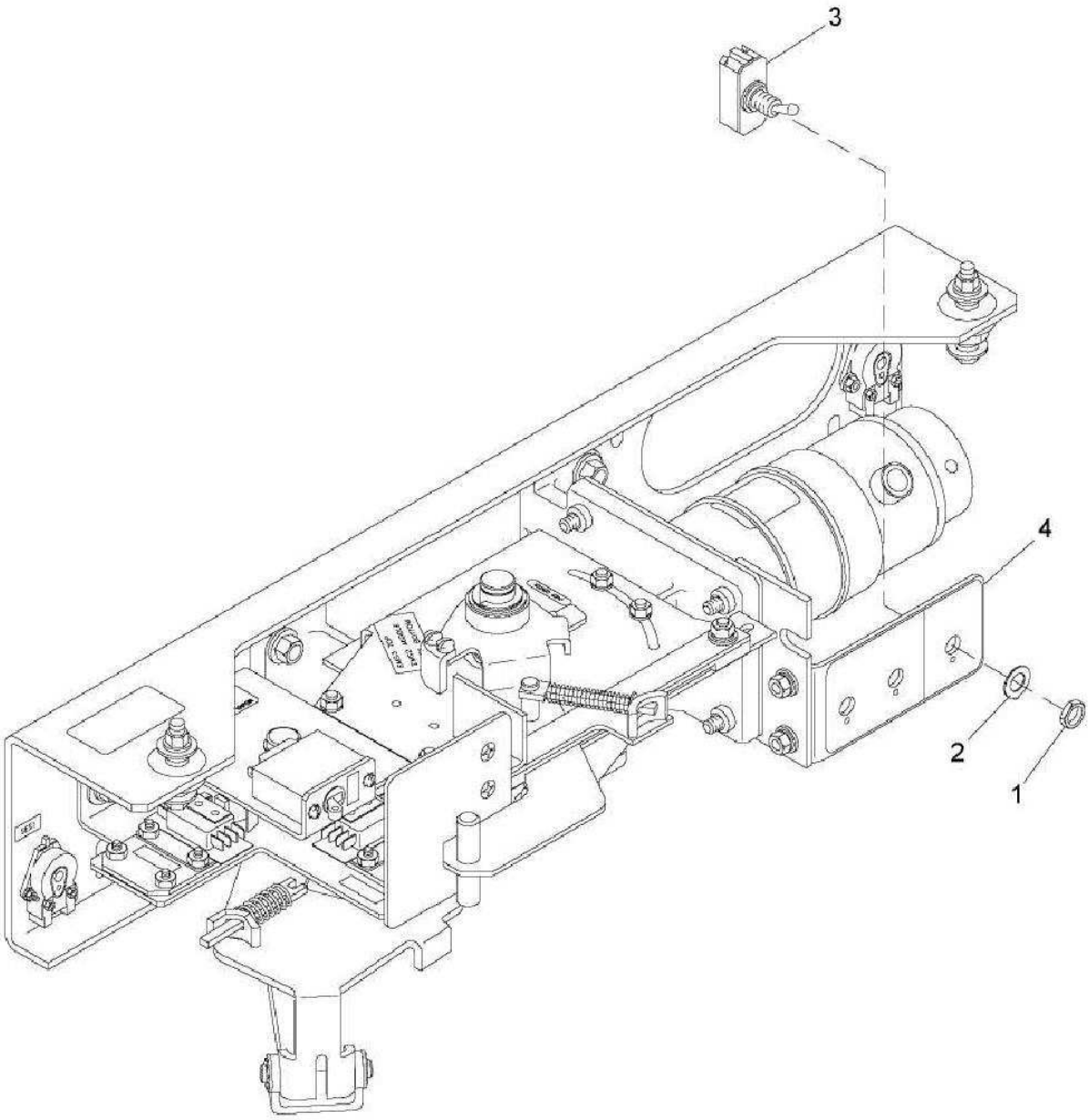

Figure 4-2.33. Door Operator Power Switches

ITEM NO.	PART NAME	QTY
	Door Operator	Ref
1	Locking Nut	3
2	Locking Ring	3
3	Power Switch	3
4	Mounting Bracket	Ref

iii) Sensitive Edge Switches

Refer to Figure 4-2.34. Door Operator Sensitive Edge Switches Remove the sensitive edge switches (3) as described below.

1. Remove and discard two nuts (1) and two plain washers (2) from each switch (3). This frees the switches.
2. Lift the switches from the baseplate assembly (4).

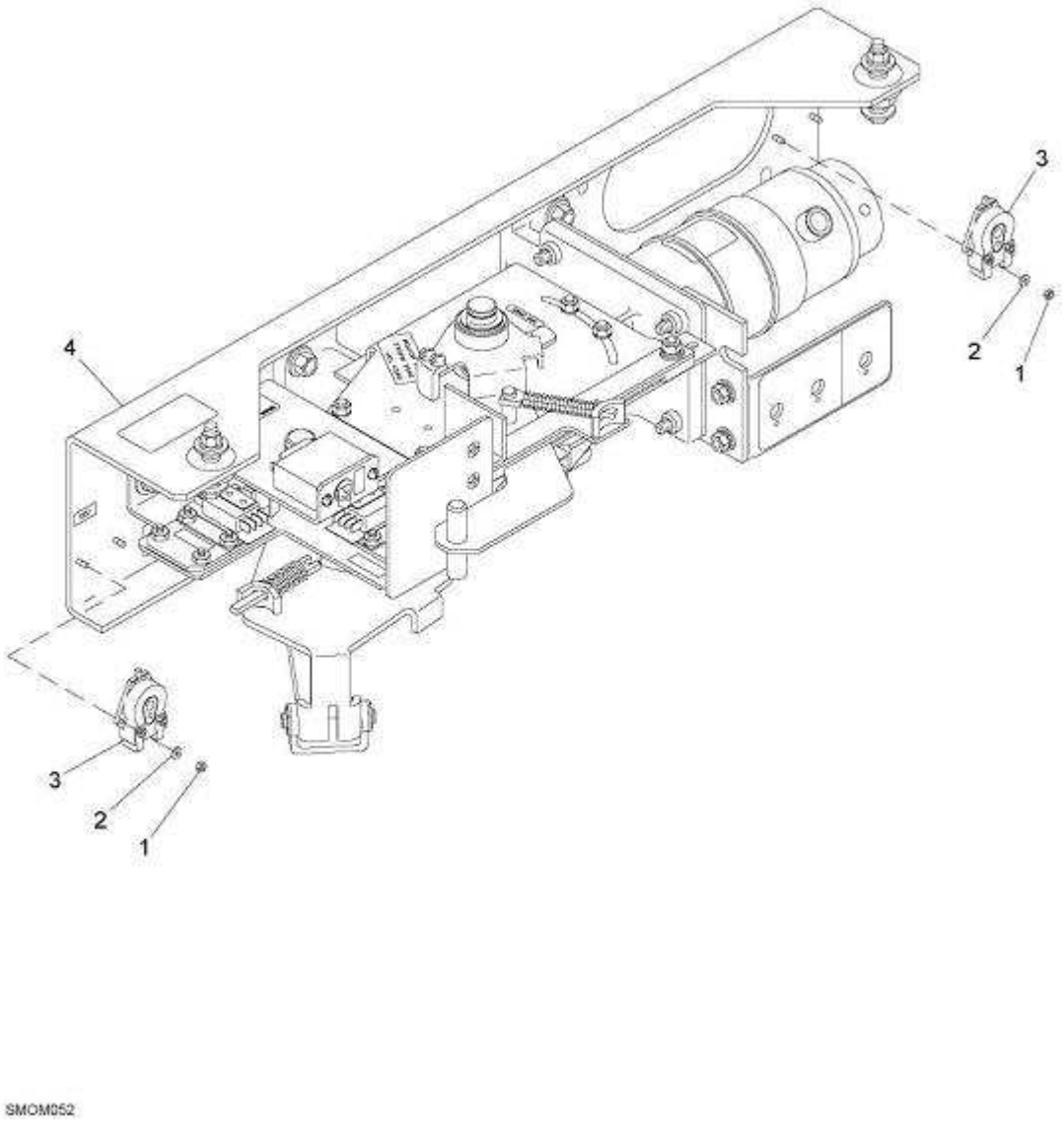

Figure 4-2.34. Door Operator Sensitive Edge Switches

ITEM NO.	PART NAME	QTY
	Door Operator	Ref
1	Keps Nut	4
2	Washer, Plain	4
3	Switch, Sensitive Edge	2
4	Baseplate	Ref

iv) Toggle, Slide Bracket, and Associated Parts

Refer to Figure 4-2.35. Door Operator Toggle, Slide Bracket, and Associated Parts. Remove the toggle assembly and slide bracket 4-18 and as described below.

1. Remove and discard two nuts (1), two lockwashers (2), and two plain washers (3) and lift off the toggle assembly (4), slide bracket (5), and switch plate (6).
2. Remove and discard the washer (7) and the compression spring (8), and remove the toggle (9).

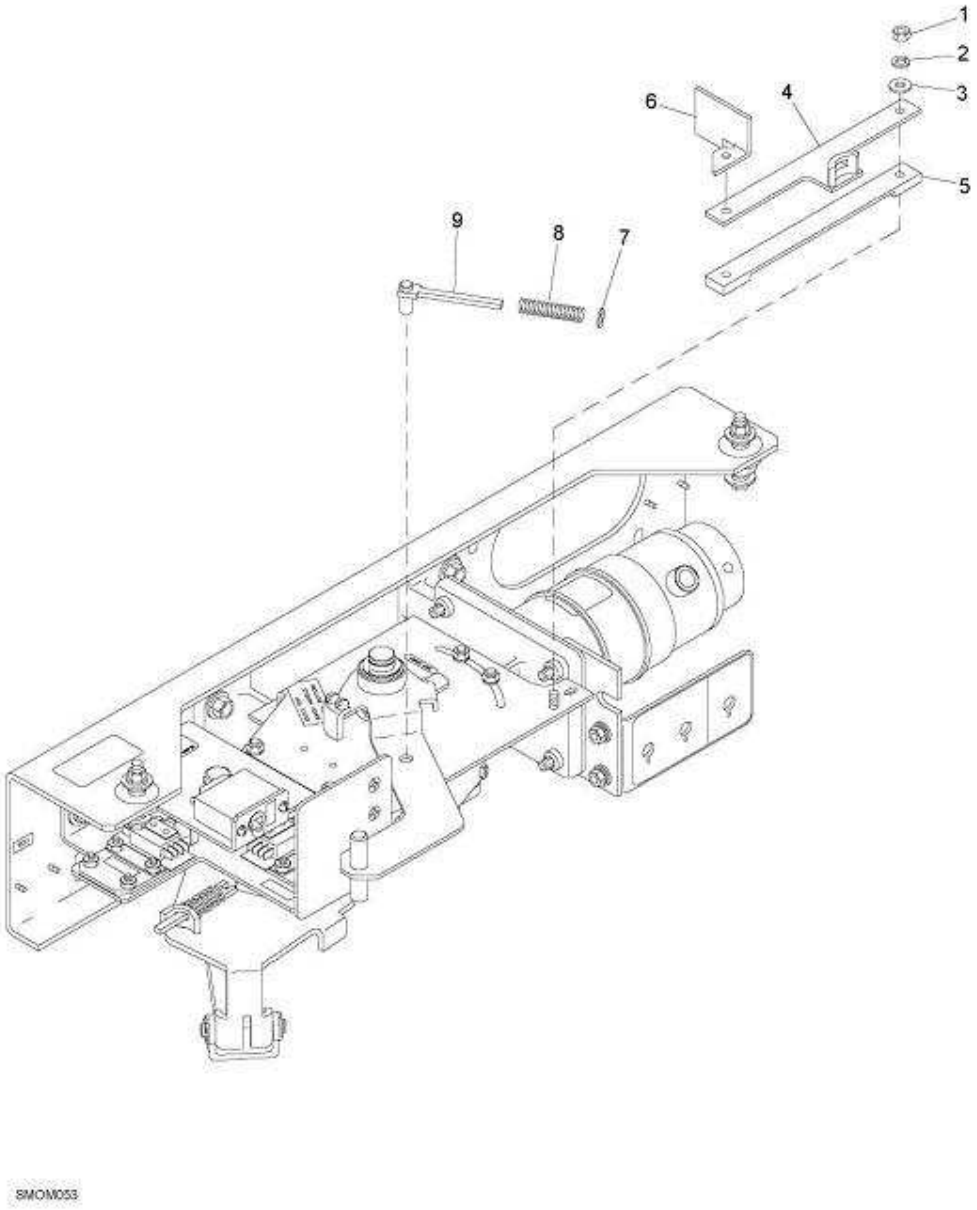

Figure 4-2.35. Door Operator Toggle, Slide Bracket, and Associated Parts

ITEM NO.	PART NAME	QTY	ITEM NO.	PART NAME	QTY
	Door Operator	Ref			
1	Hex Nut	2	6	Switch Plate	1
2	Lockwasher	2	7	Washer, Plain	1
3	Washer, Plain	2	8	Compression Spring	1
4	Toggle Assembly	1	9	Toggle	1
5	Slide Bracket	1			

v) Motor and Gear Housing

Refer to Figure 4-2.36. Door Operator Motor and Gear Housing. Remove the motor and gear housing assembly and associated parts as described below.

1. Remove one screw (1), one Keps hex nut (2), and two plain washers (3). This releases the support bracket (4) from the switch and lever bracket (5).
2. Remove two hex nuts (6) and washers (7) to release the connecting rods from the door operator.
3. Remove and discard four hex nuts (8) and four plain washers (9).
4. Remove the motor and gear housing (18) and associated parts from the baseplate.
5. Remove two hex nuts (12), two lockwashers (13), and two plain washers (14) from the cable mounting bracket (15). This frees the switch mounting bracket (16).
6. Do not remove the indicating label (17) from the switch mounting bracket unless it is damaged.

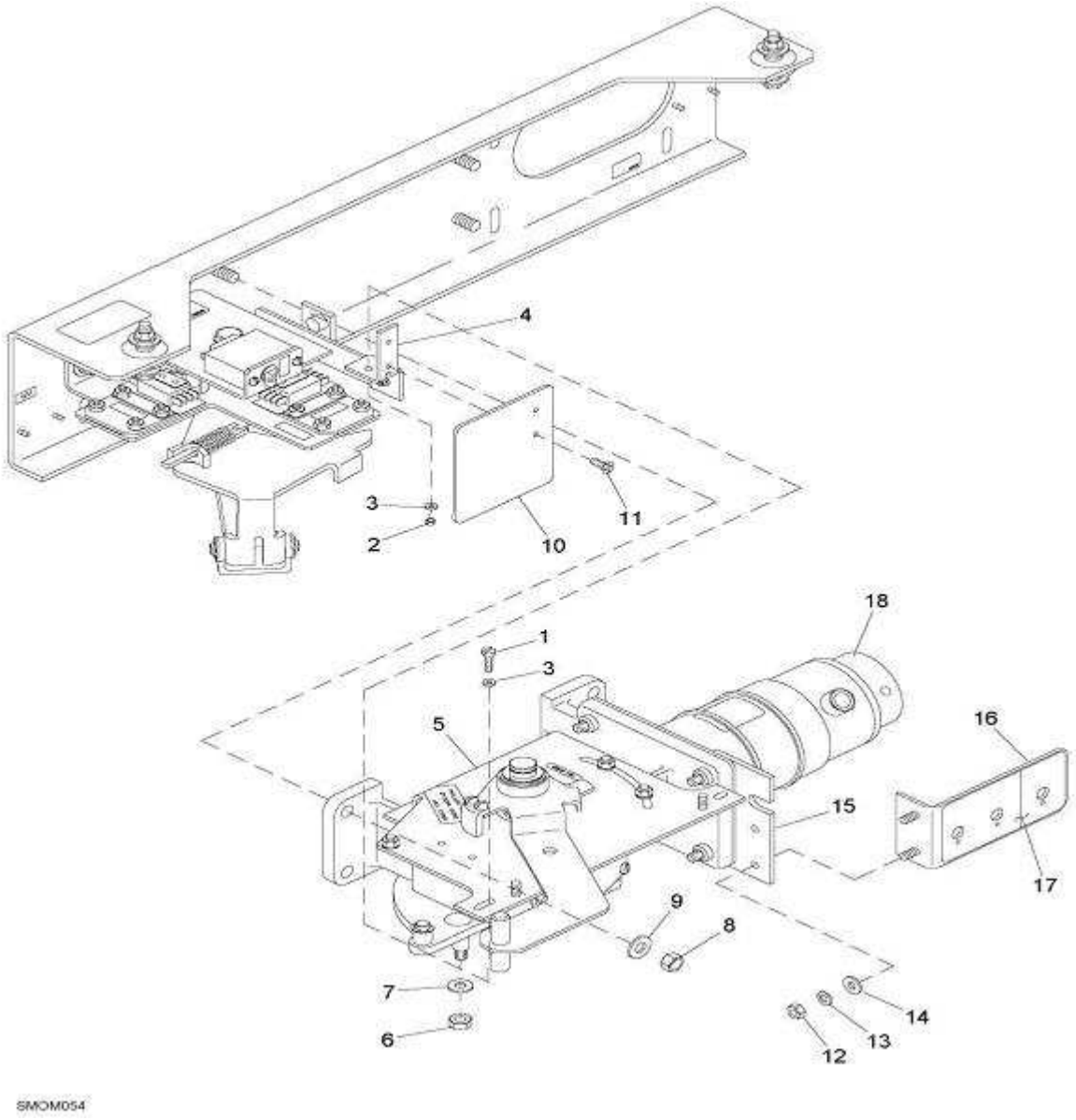

Figure 4-2.36. Door Operator Motor and Gear Housing

ITEM NO.	PART NAME	QTY	ITEM NO.	PART NAME	QTY
	Door Operator	Ref			
1	Pan Head Screw	1	10	Backing Plate	1
2	Keps Nut	1	11	Screw	2
3	Plain Washer	2	12	Hex Nut	2
4	Support Bracket	1	13	Lockwasher	2
5	Switch and Lever Bracket	Ref	14	Plain Washer	2

ITEM NO.	PART NAME	QTY	ITEM NO.	PART NAME	QTY
6	Hex Nut	2	15	Cable Mounting Bracket	Ref
7	Plain Washer	2	16	Switch Mounting Bracket	1
8	Hex Nut	4	17	Indicating Label	
9	Plain Washer	4	18	Motor and Gear Housing Assembly (See Figure 4-2.36)	Ref

vi) Door Operator Emergency Handle

Refer to Figure 4-2.38. Door Operator Emergency Handle Components. Remove the emergency handle (5), switch cam (11), lever assembly (17), and associated parts from the motor and gear housing assembly as described below.

1. Remove retaining ring (1) from the end of the gearbox output shaft (2). Lift off the thrust washer (3), flanged bearing (4), and emergency handle (5).
2. Remove two screws (7), lockwashers (8), plain washers (9), and the cam (6).
3. Drive the Spiral® pin (10) from the switch cam (11) and gearbox output shaft. Lift the switch cam from the gearbox output shaft.
4. Remove two slotted head cap screws (12), two hex nuts (13), two lockwashers (14), and four plain washers (15). Lift off the lever bracket (16).
5. Lift off the lever assembly (17) and thrust washer (18).
6. Remove two Keps hex nuts (19) and two plain washers (20). This frees the switch mounting plate (21).
7. Remove two Keps hex nuts (22) and two plain washers (23). This frees the switch mounting plate (24).
8. Remove the bumper (27), and cut and remove the harness ties (28).
9. Do not remove the identification labels (25 and 26) unless damaged or illegible.

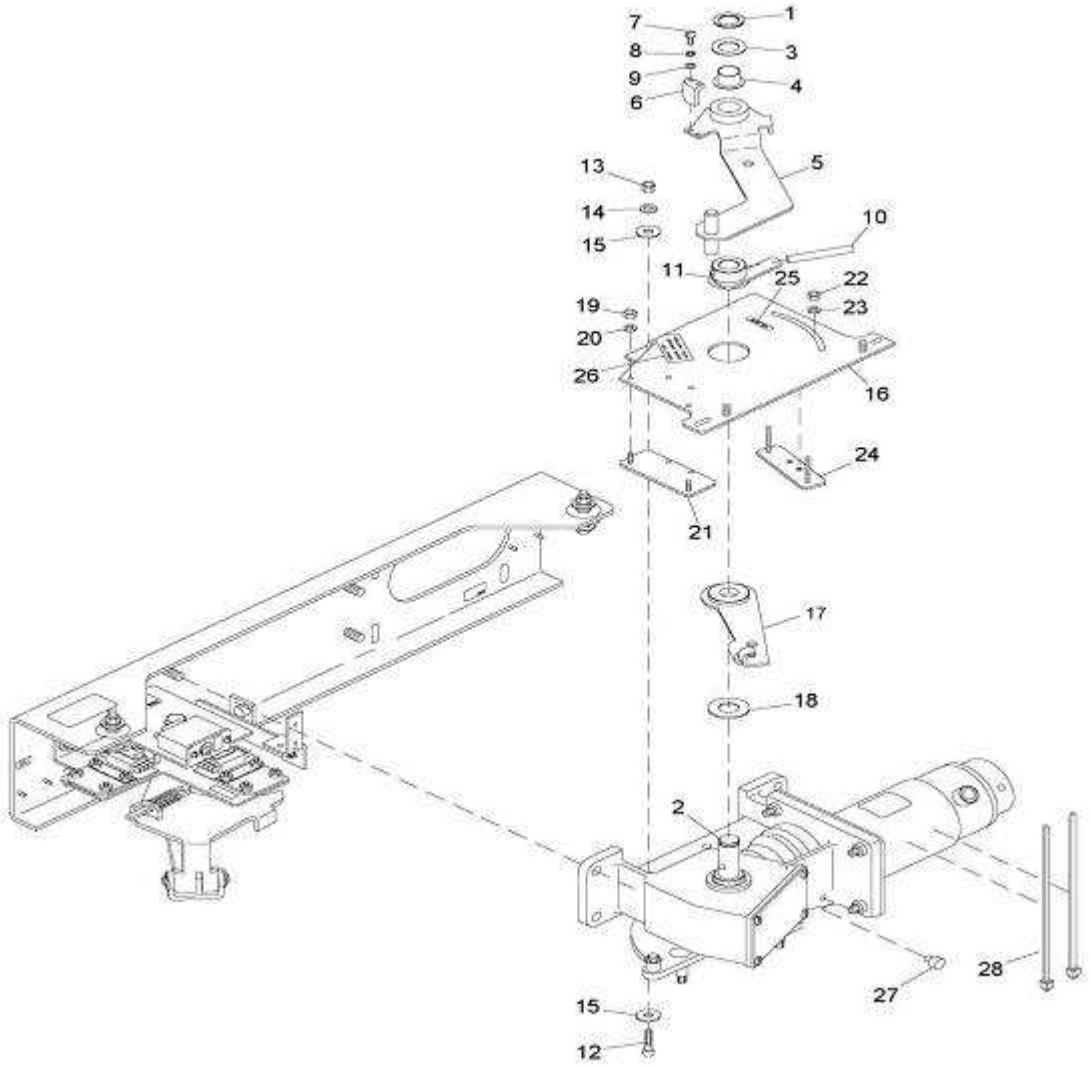

Figure 4-2.37. Door Operator Emergency Handle Components

ITEM NO.	PART NAME	QTY	ITEM NO.	PART NAME	QTY
	Door Operator	Ref			
1	Retaining Ring	1	15	Washer, Plain	2
2	Gearbox Output Shaft	Ref	16	Switch and Lever Bracket	1
3	Thrust Washer	2	17	Lever Assembly	1
4	Flanged Bearing	1	18	Thrust Washer	1
5	Emergency Handle	1	19	Keps Nut	2
6	Cam	1	20	Washer, Plain	2
7	Screw	2	21	Switch Mounting Plate	

ITEM NO.	PART NAME	QTY	ITEM NO.	PART NAME	QTY
8	Lockwasher	2	22	Keps Nut	2
9	Washer	2	23	Washer, Plain	2
10	Spiral® Pin	1	24	Switch Mounting Plate	1
11	Switch Cam	1	25	Identification Label	1
12	Screw	2	26	Identification Label	1
13	Hex Nut	2	27	Bumper	1
14	Lockwasher	2	28	Tie Wrap	2

vii) Door Operator Out of Service Assembly

Refer to Figure 4-2.38. Door Operator Door Out-of-Service Assembly. Remove the door out-of-service assembly and associated parts as described below.

1. Remove two hex nuts (1), two lockwashers (2), and two plain washers (3). This frees the door-out-of-service assembly (4) from the baseplate assembly (5).
2. Remove the Keps hex nut (6) and plain washer (7). This frees the support bracket (8).
3. Refer to section 4-2.3.d for disassembly of the door out-of-service assembly.

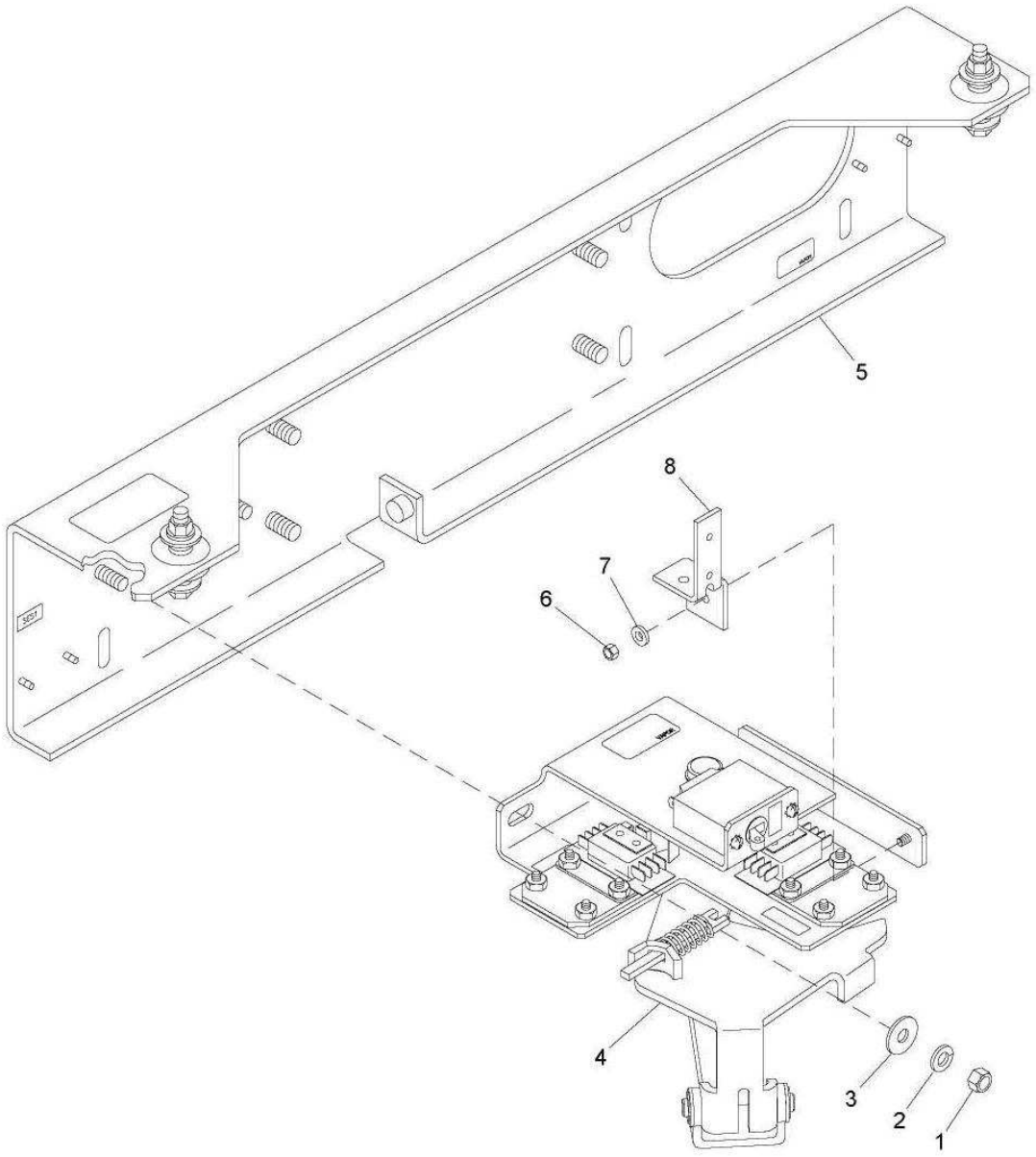

Figure 4-2.38 Door Operator Door Out-of-Service Assembly

ITEM NO.	PART NAME	QTY	ITEM NO.	PART NAME	QTY
	Door Operator				
1	Hex Nut	2	5	Baseplate	Ref
2	Lockwasher	2	6	Keps Nut	1
3	Washer, Plain	4	7	Washer, Plain	1
4	Door Out-of-Service Assembly	Ref	8	Support Bracket	1

viii) Door Operator Baseplate Assembly

Refer to Figure 4-2.39, Door Operator Baseplate Assembly. Disassemble the baseplate assembly and associated parts as described below.

1. Remove two hex nuts (1), two lockwashers (2), two plain washers (3), two cap screws (4), two plain washers (5), two insert rods (6), and two jam nuts (7) from the baseplate assembly (18).
2. Remove the bumper (8) from the baseplate.
3. Remove two nuts (11) and washers (10). Remove the harness tie plate (9) from the baseplate.
4. Remove two nuts (14) and washers (13). Remove two harness clips (12) from the baseplate.
5. Do not remove the identification labels (15, 16, and 17) from the baseplate (18) unless they have been damaged or have become illegible.

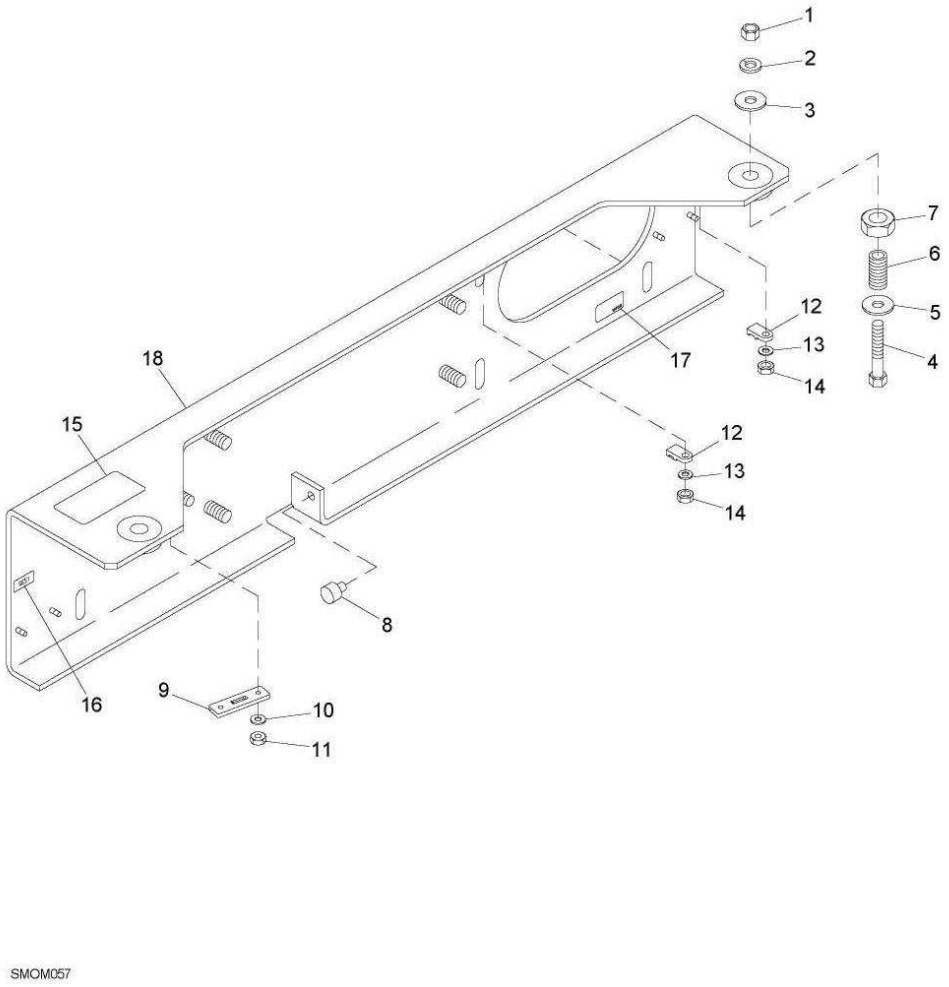

Figure 4-2.39. Door Operator Baseplate Assembly

ITEM NO.	PART NAME	QTY	ITEM NO.	PART NAME	QTY
	Door Operator				
1	Hex Nut	2	10	Washer	1
2	Lockwasher	2	11	Hex Nut	1
3	Washer, Plain	2	12	Harness Clip	2
4	Cap Screw	2	13	Washer	2
5	Washer, Plain	2	14	Hex Nut	2
6	Insert Rod	2	15	Identification Label	1
7	Jam Nut	2	16	Identification Label	1
8	Bumper	1	17	Identification Label	1
9	Harness Tie Plate	1	18	Baseplate	1

4-2.1.3.e Cleaning/Painting

- **Reference Information.**
  1. Tools / Equipment.
     – MBTA approved Cleaning Tools / Equipment (commercial).
  2. Material.
     – MBTA approved Cleaning Products (commercial) (Refer to Section 1 Table 1-9).

a) Cleaning (Door Operator Component)

Clean the door operator components to allow inspection as defined in Table 4-2.23, below.

After cleaning, inspect all components to protect them from corrosion, and apply light coat of protective oil to ferrous part that are not protected by plating or black oxide

Table 4-2.23. Door Operator Component Cleaning Instructions

FIGURE AND ITEM	PART NAME	CLEANING METHODS AND MATERIALS
Figure 4-2.35-4	Toggle assembly	Clean with a nonvolatile, residue free solvent; air blow dry
-5	Slide bracket	
-6	Switch plate	
-9	Toggle	
Figure 4-2.36-4	Support bracket	
10	Backing plate	
-16	Switch mounting bracket	
10	Backing plate	
-16	Switch mounting bracket	
-18	Motor and gear housing	Motor and Gear Housing Component Cleaning Instructions.
Figure 4-2.37-5	Emergency handle	Clean with a nonvolatile, residue free solvent; Air blow dry.
-11	Switch cam	
-16	Lever bracket	
-17	Lever Assembly	

FIGURE AND ITEM	PART NAME	CLEANING METHODS AND MATERIALS
-17	Lever Assembly	
-21- 24	Switch mounting plate	Clean with a nonvolatile, residue free solvent; Air blow dry.
Figure 4-2.38-4	Door out-of-service assembly	Refer to Table 4-2.30, Door Out-of-Service Component Cleaning Instructions.
-8	Bracket	Clean with a nonvolatile, residue free solvent; Air blow dry.
Figure 4-2.39-6	Insert rod	
-9	Tie plate	
-12	Tie clip	
-18	Baseplate	

b) Painting (Door Operator Component) (Not Applicable)

4-2.1.3.f Inspection

- **Reference Information.**
  1. Tools / Equipment (Not Applicable).
     – MBTA Carhouse Standard Tools Kit.
  2. Material (Not Applicable).

  Inspect the door operator components according to the specific instructions provided and Table 4-2.24, below, and Figure 4-2.25. Door Out-of-Service Assembly .

Table 4-2.24. Door Operator Component Inspection Methods and Criteria

FIGURE AND ITEM	PART NAME	INSPECTION METHODS AND CRITERIA
Figure 4-2.35-4	Toggle assembly	Visually inspect for deformation, corrosion, excessive wear, and damage; replace as necessary.
-5	Slide bracket	
-6	Switch plate	
-9	Toggle	

FIGURE AND ITEM	PART NAME	INSPECTION METHODS AND CRITERIA
Figure 4-2.36-4	Support bracket	
-10	Backing plate	
-16	Switch mounting bracket	
-18	Motor and gear housing	Motor and Gear Housing Component Inspection Methods and Criteria.
Figure 4-2.37-4	Flanged bearing	Visually inspect for deformation, corrosion, excessive wear, and damage;
-5	Emergency handle	replace as necessary.
-10	Spiral pin	Visually inspect for deformation, corrosion, excessive wear, and damage;
-11	Switch cam	replace as necessary.
		Inspect the fit of the Spirol pin with the switch cam. The pin must maintain a press fit with the switch cam. If the pin and switch cam are not a press fit, replace both parts.
-16	Lever bracket	Visually inspect for deformation, corrosion, excessive wear, and damage; replace as necessary.
-17	Lever assembly	
-21 -24	Switch mounting plate	Visually inspect for deformation, corrosion, excessive wear, and damage;inspect the threaded posts for thread damage; replace as necessary. Refer to Table 4-2.30 Door Out-of-Service Component Inspection Methods and Criteria, Door Out-of-Service Component Inspection Methods and Criteria.
Figure 4-2.38-4	Door out-of-service assembly	
-8	Bracket	Visually inspect for deformation, corrosion, excessive wear, and damage; replace as necessary
Figure 4-2.39-6	Insert rod	
-9	Harness tie plate	
-12	Harness clip	
-18	Baseplate	

4-2.1.3.g Repair (Not applicable)

4-2.1.3.h Reassembly

- **Reference Information.**
  1. Tools / Equipment.
     – MBTA Overhaul Standard Tools Kit.
  2. Material (Not Applicable).
- **Procedure**

a) Reassembly Door Operator and Wiring Harness

Refer to Figure 4-2.30. Door Operator with Wiring Harness, and Figure 4-2.31. Door Operator with Wiring Harness Removed. Attach the wiring harness to the door operator assembly as described below.

1. Position the wiring harness on the door operator assembly as shown in Figure 4-2.30.
2. Attach each lead to the terminal from which it was disconnected. As each terminal is connected, maintain the orientation of the wiring harness. Tighten the terminal connection per good shop practice.
3. When all connections have been completed, check to make sure there is no strain on the wiring and the terminals. Secure the wiring harness to the door operator using nylon ties (2).

CAUTION: **Make sure the wiring harness is positioned so there is no interference with mechanical operation of the door operator mechanism**.

Reassembly of door operator

Door operator reassembly instructions as follows:

ix) Door Operator Base plate

Refer to Figure 4-2.39. Door Operator Base plate Assembly. Reassemble the base plate (9) and associated parts as described below.

NOTE: **To assure good adhesion, make sure the area where the identification label is placed is clean, with oil, grease, and dirt removed before attaching the label.**

1. If the identification labels (15, 16, and 17) were removed from the base plate (9) peel the backing from each identification label and attach it, where indicated.

2. If the harness clips (12) were removed, position them on the base plate (18). Secure them with plain washers (13) and hex nuts (14). Tighten the nuts to 13 ± 1 inch pounds.
3. If the harness tie plate (9) was removed, position it on the base plate (18). Secure it with plain washers (10) and hex nuts (11). Tighten the nuts to 13 ± 1 inch pounds.
4. Insert a new bumper (8) on the base plate (18).
5. Install two jam nuts (7), two insert rods (6), two plain washers (5), two cap screws (4), two plain washers (3), two lock washers (2), and two hex nuts (1). These are adjusted at installation of the door operator on the car.

x) Door Out of Service Assembly

Attach the parts removed from the door-out-of-service assembly and mount the door-out-of-service assembly to the base plate as described below. Refer to Figure 4-2.38. Door Operator Door Out-of-Service Assembly.

1. Position the support bracket (8) over the stud on the door out-of-service assembly (4). Place the plain washer (7) over the stud, and install the Keeps nut (6) on the stud. Tighten the Keeps nut to 19 ± 1 inch pounds.
2. Position the door-out-of-service assembly (4) over the studs on the base plate (5). Place two plain washers (3), two lock washers (2), and two hex nuts (1) on the studs. Tighten the hex nuts to 16 ± 1 foot pounds.

xi) Emergency Handle, Switch Cam, and Lever Assembly

Assemble the emergency handle, switch cam, and lever assembly to the motor and gear housing assembly as described below. Refer to Figure 4-2.37. Door Operator Emergency Handle Components.

1. Route the motor leads on the motor assembly along the outside of the motor and secure them with two harness ties (28).
2. Install the bumper (27) on the motor assembly.
3. Insert the studs on the switch mounting plate (24) through the mating holes on the lever bracket (16). Place two plain washers (23) and two Keeps nuts (22) on the studs. Tighten the nuts to 19 ± 1 inch pounds.
4. Insert the studs on the switch mounting plate (21) through the mating slot on the lever bracket (16). Place two plain washers (20) and two Keeps nuts (19) on the studs. Tighten the nuts to 19 ± 1 inch pounds.
5. Place the thrust washer (18) over the gearbox output shaft (2).
6. Place the lever assembly (17) over the gearbox output shaft.

7. Place the lever bracket (16) over the gearbox output shaft and position the lever bracket against the gear housing flange.
8. Install two plain washers (15) and two cap screws (12) through the lever bracket and gear housing flange. Install two plain washers (15), two lock washers (14), and two hex nuts (13) on the cap screws. Tighten the screws to 16 ± 1 foot pounds.;
9. Place the switch cam (11) over the gearbox output shaft and align the holes in the switch cam and output shaft for the roll pin (10). Drive the roll pin into the switch cam and gearbox output shaft from the side closest to the motor. Drive the pin through the cam and shaft so that it protrudes 1.00 ± 0.02 inch on the side of the switch cam nearest the motor.
10. Place the emergency handle (5) over the gearbox output shaft. Place the flanged bearing (4) and thrust washer (3) over the output shaft (2) and install the retaining ring (1) on the end of the output shaft. Make sure the retaining ring is seated evenly in the retaining ring groove.

xii) Motor and Gear Housing

Install the motor and gear housing assembly on the base plate as described below. Refer to Figure 4-2.36.Door Operator Motor and Gear Housing.

NOTE: Make sure the area the indicating label will be placed is clean, and oil and grease free before attaching the label so that there is good adhesion.

1. If the indicating label (17) was removed from the switch mounting bracket (16) peel the backing from the indicating label and attach it, where shown.
2. Place the studs on the switch mounting bracket (16) through the mating holes on the cable mounting bracket (15). Place two plain washers (14), two lock washers (13), and two hex nuts (12) on the studs. Tighten the hex nuts to 8 ± 1 foot pounds.
3. Install the backing plate (10) and secure it with two screws (11). Tighten the screws to 22 ± 1 inch pounds.
4. Position the motor and gear housing assembly (18) over the mounting studs on the base plate. Install four plain washers (9) and four hex nuts (8) on the studs. Tighten the hex nuts to 28 ± 2 foot pounds.
5. Align the screw hole in the support bracket (4) with the screw hole in the lever bracket (5).
6. Install the plain washer (3) on the pan head screw (1), and install the pan head screw (1) through the lever bracket and the support bracket. Install the plain washer (3) and Keeps nut (2) on the screw. Tighten the screw to 19 ± 1 inch pounds.

xiii) Toggle Assembly and Slide Bracket

1. Install the toggle assembly and slide bracket and associated parts as described below. (Refer to Figure 4-2.35. Door Operator Toggle, Slide Bracket, and Associated Parts)
2. Place the slide bracket (5) over the studs on the switch and lever bracket.
3. Place the compression spring (8) and washer (7) on the toggle (9).
4. Place the toggle (9) in the emergency handle. Position the end of the toggle into the toggle assembly (4). Compress the spring and place the toggle assembly over the studs on the switch and lever bracket.
5. Place the bracket (6) on the stud nearest the emergency handle.
6. Install two plain washers (3), two lock washers (2), and two hex nuts (1) on the studs. Tighten the hex nuts to 8 ± 1 foot pounds.

xiv) Door Operator Sensitive Edge Switches

Refer to Figure 4-2.34. Door Operator Sensitive Edge Switches. Install the sensitive edge switches on the baseplate as described below.

1. Place the switches (3) over studs on the baseplate (4).
2. Place two plain washers (2) and two hex nuts (1) on the studs for each switch. Tighten the hex nuts to 10 ± 1 inch pounds.

xv) Door Operator Power Switch

Refer to Figure 4-2.33. Door Operator Power Switches. Install the door and bridgeplate power switches as described below.

1. Insert the switch (3) toggle through the switch bracket (4) and align the keyway in the switch with the key in the switch bracket.
2. Install the locking ring (2) on the nose of the switch. Maintain the switch position, and install the locking nut (1). Tighten the locking nut (1) to good shop practice.

xvi) Door Operator EMS and Lever Switches

Refer to Figure 4-2.32. Door Operator EMS and Lever Switches. Install switches EMS 1 and EMS 2, and the overcenter switch as described below.

1. Install the spacer (15), insulating tubing (16), washer (14), and screw (13) on the switch (9).
2. Install three plain washers (12) and screws (11) on the switch (9).

3. Place one lockwasher (7) and one plain washer (8) on each of two screws (6).

CAUTION: DO NOT OVERTIGHTEN THE SWITCH SCREWS. OVERTIGHTENING THE SWITCH SCREWS CAN DAMAGE THE SWITCH.

4. Insert the screws through the lever switch (9) and the insulator (10) and position the switch and insulator (10) on the switch mounting plate (17). Tighten the screws (6).
5. Adjust the position of the switch (9) as follows.
6. (Refer to the diagram, Switch Positioning Diagram, below.) Place a 0.015 inch spacer between the switch actuation cam (A) and the switch actuation lever (B). Loosen the nuts (C) holding the switch mounting plate (5) enough to allow the switch mounting plate to be adjusted.
7. Carefully adjust the switch (9) position by moving the mounting plate until the switch bottoms with the spacer in place. Tighten the nuts (C) to 19 ± 1 inch-pounds.

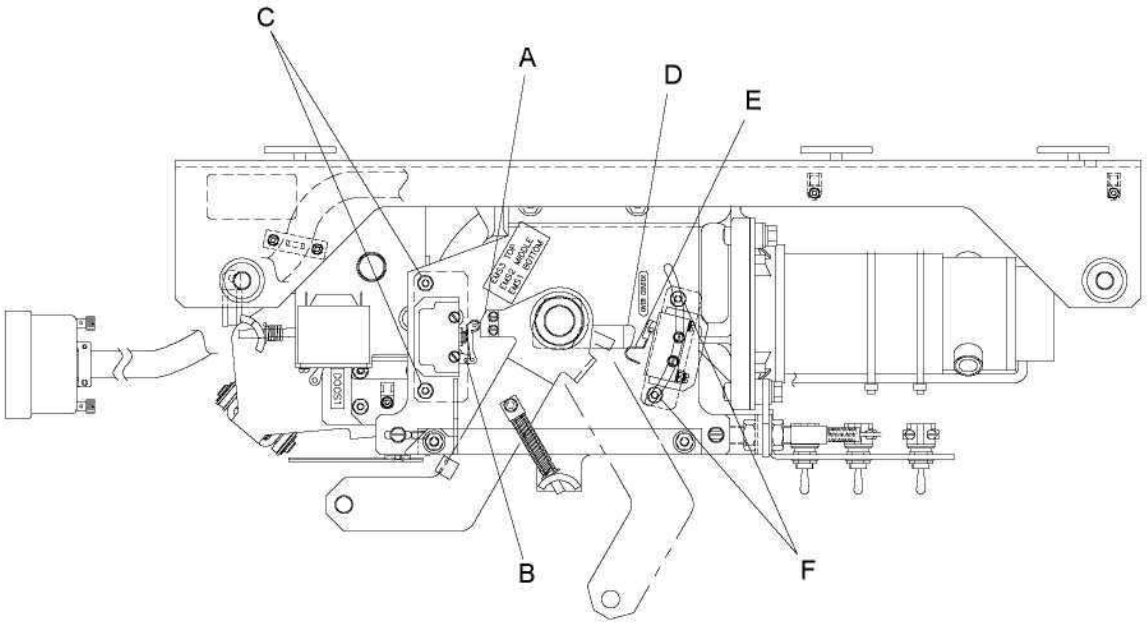

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Figure 4-2.40 Switch Positioning Diagram

CAUTION: DO NOT OVERTIGHTEN THE SWITCH SCREWS. OVERTIGHTENING THE SWITCH SCREWS CAN DAMAGE THE SWITCH

8. Place one plain washer (2) on each of two screws (1).
9. Insert the screws through the stacked switches (3) and switch insulators (4).
10. Position the switch stack on the switch mounting plate (5). Tighten the screws (1) to 10 ± 1 inch pounds. Do not tighten the screws to the point that they deform the switches.

b) Installation of Door Operator with Wiring Harness

Refer to Figure 4-2.30, Door Operator with Wiring Harness. Install the door operator and wiring harness assembly on the train car as described below. The adjustment procedures are part of the installation instructions.

1. Position the door operator assembly (13) over the mounting bars (12). Install five plain washers (11) and hex nuts (10). Tighten the hex nuts to 16 ± 1 foot pounds.
2. Attach the manual release cable (2) as described below.
3. Place the cable through the cable slot in the cable mounting bracket (4). One plain washer and one nut on the cable must be on each side of the mounting bracket.
4. Place the slot in the cable support bracket (3) over the cable on the clevis side of the cable mounting bracket, with the cable support bracket between the washer and the mounting bracket.
5. Attach the cable support bracket (3) to the switch and lever bracket using one plain washer (9) and one screw (8).
6. Align four plain washers (7) and the manual release cable clevis with the pin hole in the lever assembly. Install the clevis pin (6) through the washers, lever assembly, and clevis. Insert the cotter pin (5) into the clevis pin.
7. Tighten the nuts on the manual release cable assembly to secure the cable at the cable mounting bracket and cable support bracket.
8. Reattach the car wiring harness at the door operator main connector.

Door operator installation

The door operator is installed on the door as same as installation of Door Operator with Wiring Harness

i) Door Operator Installation

(This step is required only if the operator must be replaced) *

1. With the aid of an assistant, install the door operator assembly on the module frame header extrusion using the fasteners supplied with the door operator assembly. Make sure that the threaded spacers on the top of the base plate are not protruding beyond the top surface of the base plate. If they are protruding, loosen the jam nuts and adjust the spacers to bring them flush or below the surface. Do not torque mounting fasteners at this time.
2. Raise the door operator as high as possible so that the base plate rests flush against the top of the header extrusion. While holding the door operator in this position, tighten the five fasteners securing the door operator to the vertical wall of the header extrusion. Torque these fasteners to 19 ft-lbs.
3. Loosen the jam nuts securing the threaded spacers to the base plate assembly. Adjust the spacers until they make contact with the surface of the header extrusion. Finger tighten the spacers and secure their adjustment by tightening the jam nuts.
4. Insert the 1/4 inch mounting bolts through the spacers and header extrusion. Torque the bolts to 9 ft-lbs.

4-2.1.3.i Adjustment/Test

a) Adjustment

i) Adjustment of Door Operator and Wiring Harness

The door operator is not adjusted at installation.

ii) Door Operator Assembly

All adjustments not made at assembly, are made during on-car testing and adjustment of the door assembly. Refer to section 4-2.1.3.i b)**,** On-Car Testing.

b) Test

(A) Bench Test

i) Bench Test of door operator and wiring harness assembly

The door operator and wiring harness assembly is not bench tested after overhaul. Both the door operator and wiring harness are bench tested separately, and are tested again during the on-car testing of the door module.

ii) Bench Test of door operator

After overhaul has been completed, check the operation of the door operator assembly before it is returned to service as described below.

1. Check the motor and gearbox operation. Provide electric power to the motor, and drive the motor and gearbox in each direction.
2. Check the sensitive edge switches to make sure each switch actuates.
3. Check the EMS switches to make sure they actuate properly.
4. Check the overcenter switch to make sure it actuates properly.
5. Actuate the door out-of-service mechanism. Operate it, making sure the mechanism operates smoothly, remains locked in the actuated position, and actuates the door out-of-service switch.
6. Operate the emergency actuation lever. The lever must move smoothly, and remain locked over center until it is returned to the normal position by hand.

(B) On Car Testing

i) On Car Testing of door operator and wiring harness assembly

The door operator and wiring harness assembly are tested on the car after the door operator is connected to the door mechanism.

ii) On Car Testing of door operator

On-car testing is accomplished during on-car testing of the **door assembly. On-Car Testing**

4-2.1.4 Manual Emergency Release Mechanism

4-2.1.4.a Description & Operation

The door operator includes a Manual Release Mechanism, a 2-position, manual actuation lever on the door operator assembly that can be actuated 2 ways to open the door in an emergency. The emergency operation mechanism uses a toggle that compresses a spring and passes overcenter to either selected position, where it is held in position by the spring. When the door must be opened by the emergency door release, lowing the handle engages the door opening mechanism and moves the teeter plate from the overcenter position. This backdrives the geartrain and motor and opens the door slightly. Completely opening the doors requires pushing them open by hand, which backdrives the geartrain and motor.

The Manual Emergency Door Release Handle (Refer to Figure 4-2.41) protrudes through the hinged closeout cover for the door operator compartment, and is accessible from the car interior in high floor cars. Because the handle is out of normal reach in the low floor area of the car, a Passenger Emergency Stop Handle (Refer to Figure 4-2.41) is located approximately 50 in. above floor level. The handle is in a recess at the right hand side of the A2, A3, B2, and B3 doors. This T-handle is connected by a pull cable to the door operator manual release mechanism. During normal operation the handle is vertical in the recess. Rotating the T-handle 90° downward to the horizontal position pulls the cable, moves the teeter plate away from the overcenter position, and opens the car door slightly. The crew member or a passenger can then push the door completely open.

An exterior manual release provides crew access to the A1 and B1 doorways from outside the vehicle. This manual release is also a recessed T-handle connected by a pull cable to the manual release mechanism. It is located outside and to the left of these doors. The T-handle is secured from passenger access behind a closed and locked access door opened by the standard crew key.

During normal operation, the handle is stowed. In an emergency, rotating the lever assisted T-handle 90° downward to the horizontal po sition pulls the cable, moves the teeter plate away from the overcenter position, and opens the car door slightly. This allow the crew member to push the door completely open. On the straight T-handle emergency release, a direct pull actuates the emergency release.

To reset the manual releases, return the door operator manual release lever to the NORMAL position from the EMERGENCY position. This closes and locks the doors. Return the T-handles to the stowed orientation and position.

In an emergency, operate a door that it out of service by the same actions. Taking a door out of service through the door out-of-service mechanism only prevents operating the door through electric power and does not affect the mechanical operation of the door. Either of the manual operating levers bypass the door out-of-service mechanism.

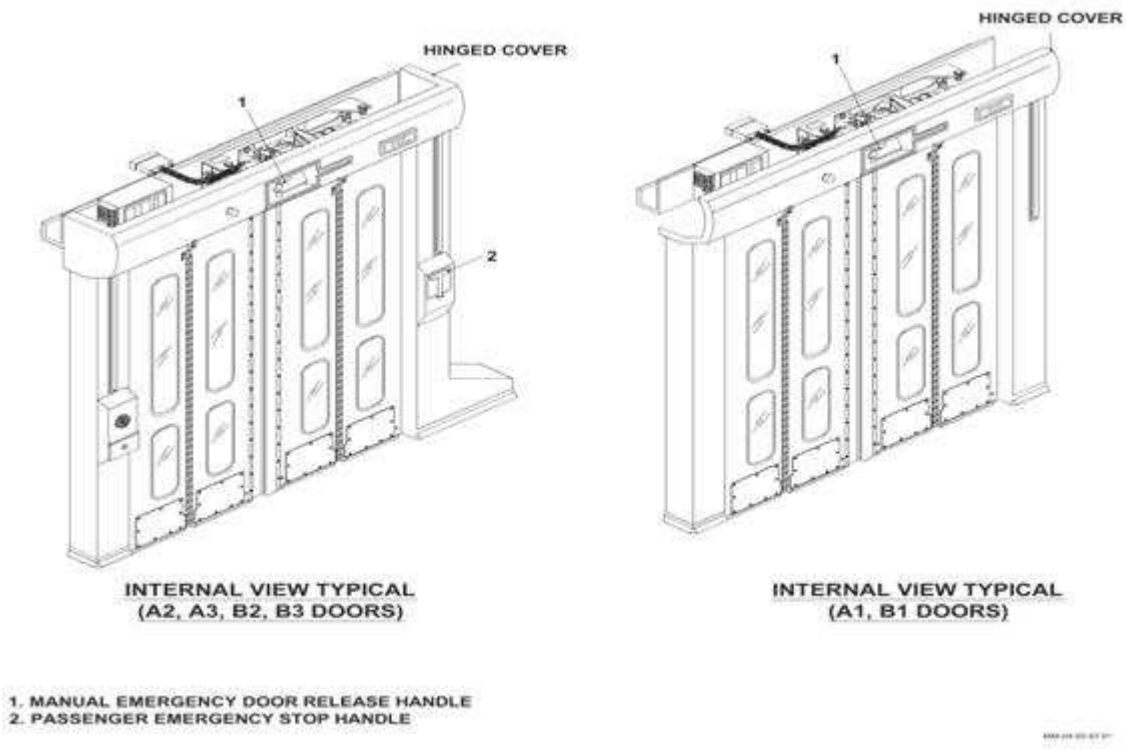

Figure 4-2.41 Door Emergency Release – Handles Location

4-2.1.4.b Specific Safety Precautions

For Specific Safety Precautions refer 4-2.b

4-2.1.4.c Fault/Isolation

For fault isolation refer to section 4-2.c

4-2.1.4.d Disassembly

- **Reference Information.**
  1. Tools / Equipment.
     – MBTA Overhaul Standard Tools Kit.
  2. Material (Not Applicable).
- **Procedure**

a) Removal for Heavy Maintenance

xvii) Removal of Manual release assembly

Refer to Figure 4-2.42. Manual Release Assembly. Remove the manual release assembly as described below.

WARNING:	**IF THE DOORS MOVE UNEXPECTEDLY DURING REMOVAL OF THE MANUAL RELEASE ASSEMBLY PERSONAL INJURY ISPOSSIBLE. BEFORE BEGINNING REMOVAL, SHUT OFF THE POWER TO THE DOOR OPERATOR ASSEMBLY. DISABLE THE DOORS SO THAT THEY CANNOT BE MOVED DURING THE MAINTENANCE PROCEDURE UNLESS THE MOVEMENT IS DELIBERATE AND REQUIRED**

1. Shut off power to the door operator. Disable the doors to prevent unexpected movements.
2. Remove the car builder hardware that attaches the manual release assembly to the car body.
3. Tip the manual release mechanism away from the car wall and pull it outward to gain access to the connection to the cable assembly.
4. Remove the roll pin (1) from the release cable connection bracket that protrudes from the manual release housing (2). This frees the end of the manual release cable (3).
5. Remove the nut (3A) and washer (3B) from the end of the cable. Slide the cable through the cable mount pin (4).

6. Remove the second washer (3C) and nut (3D) from the cable assembly and pass the cable end through the snap bushing (5) to completely free the manual release assembly from the cable assembly.

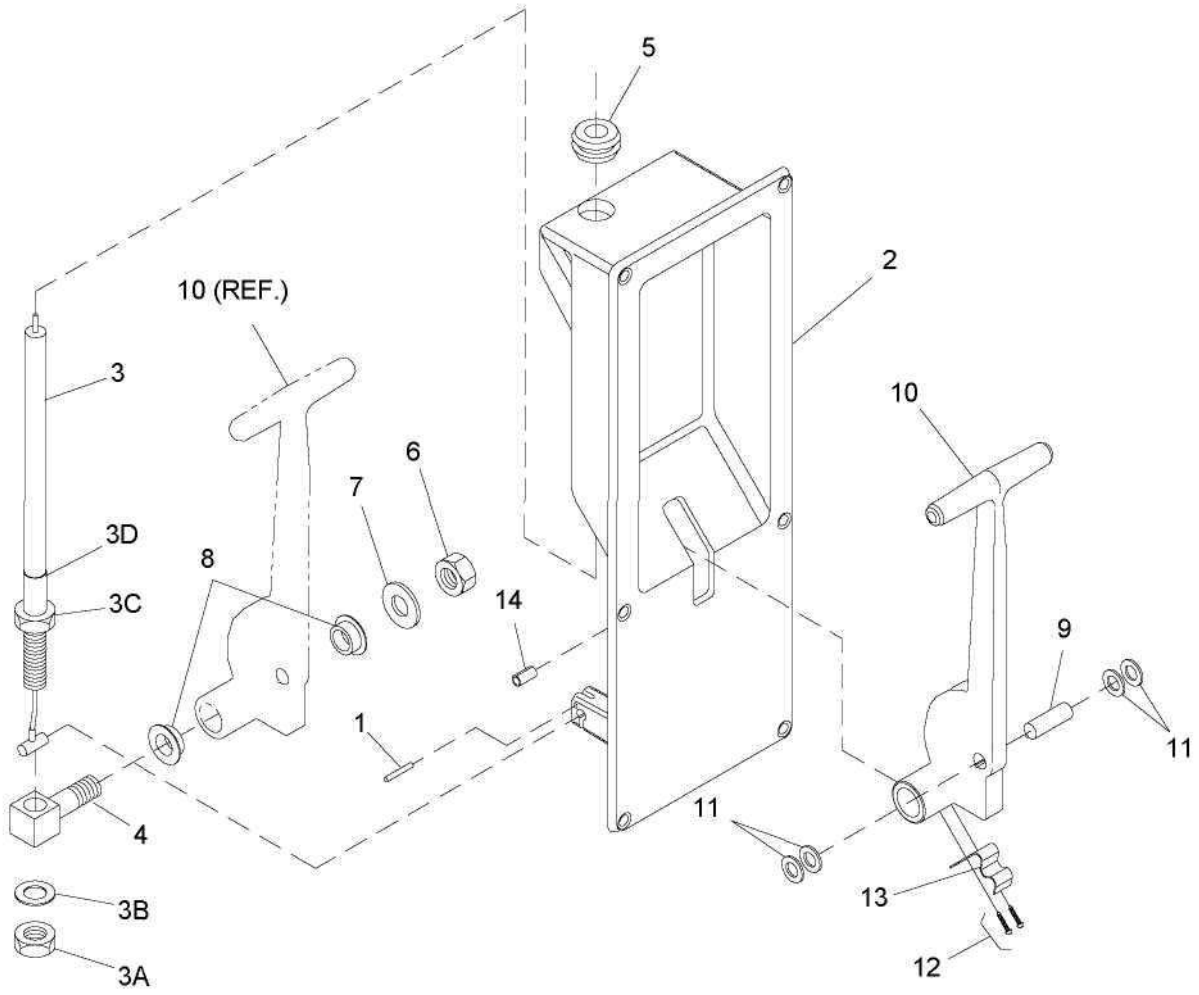

Figure 4-2.42. Manual Release Assembly

ITEM NO.	PART NAME	QTY	ITEM NO.	PART NAME	QTY
	Manual Release Assembly	Ref			
1	Rollpin	1	6	Locking Nut	
2	Manual Release Housing	1	7	Plain Washer	1
3	Release Cable Assembly	Ref	8	Flanged Bearing	2
3A	Hex Nut	Ref	9	Dowel Pin	1

ITEM NO.	PART NAME	QTY	ITEM NO.	PART NAME	QTY
3B	Washer	Ref	10	Manual Release Handle	1
3C	Washer	Ref	11	Washer	4
3D	Hex Nut	Ref	12	Button Head Screw	2
4	Cable Mount Pin	1	13	Lever Spring	1
5	Snap Bushing	1	14	Rollpin	1

xviii) Removal of Manual release cable assembly

Refer to Figure 4-2.43 Door Module Components, End Doors (Sheet 1 of 3) and Figure 4-2.30 Door Operator with Wiring Harness. Remove the manual release cable for heavy maintenance as described below.

1. Disconnect and release the top end of the cable release assembly at the door operator assembly as described in section 4-2.1.2.d a)
2. Disconnect the manual release cable from the manual release handle according to section 4-2.1.3.d i)
3. Open or remove car interior panels, as applicable, to gain access to the manual release cable.
4. Remove the manual release cable from its mountings in the car body. Note the position of each mounting point that is not a permanent attachment.

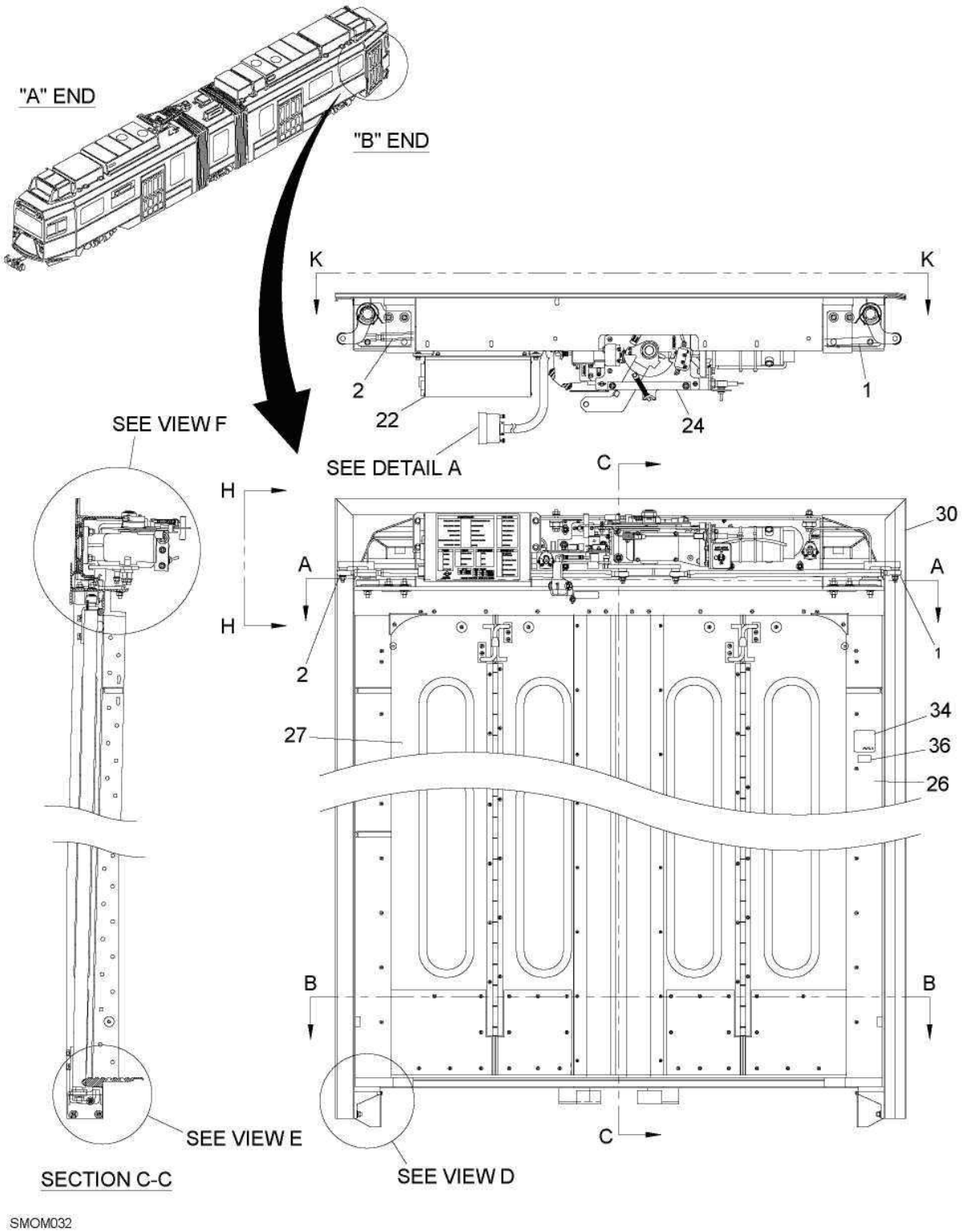

Figure 4-2.43 Door Module Components, End Doors (Sheet 1 of 3)

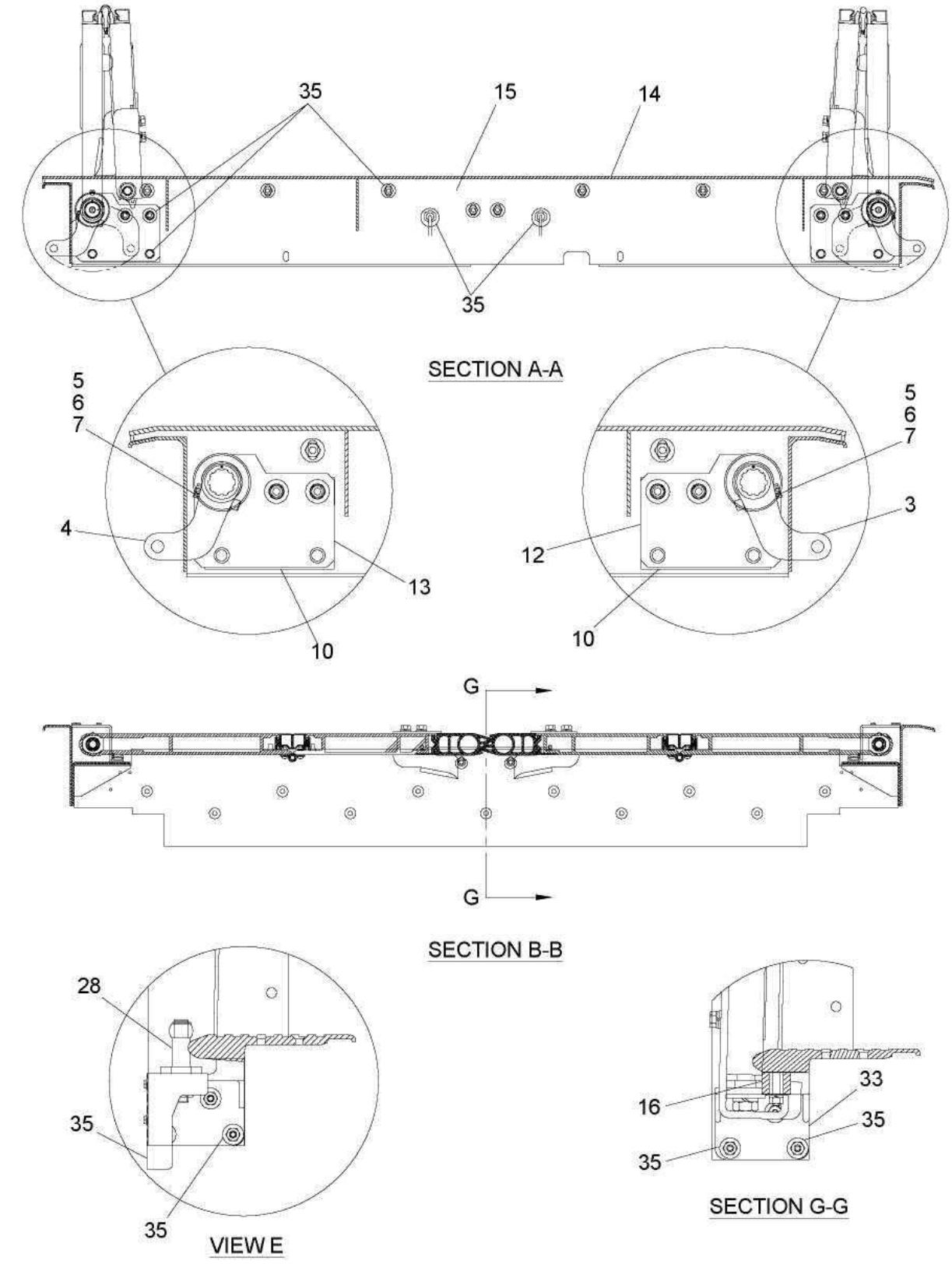

Figure 4-2.43 Door Module Components, End Doors (Sheet 2 of 3)

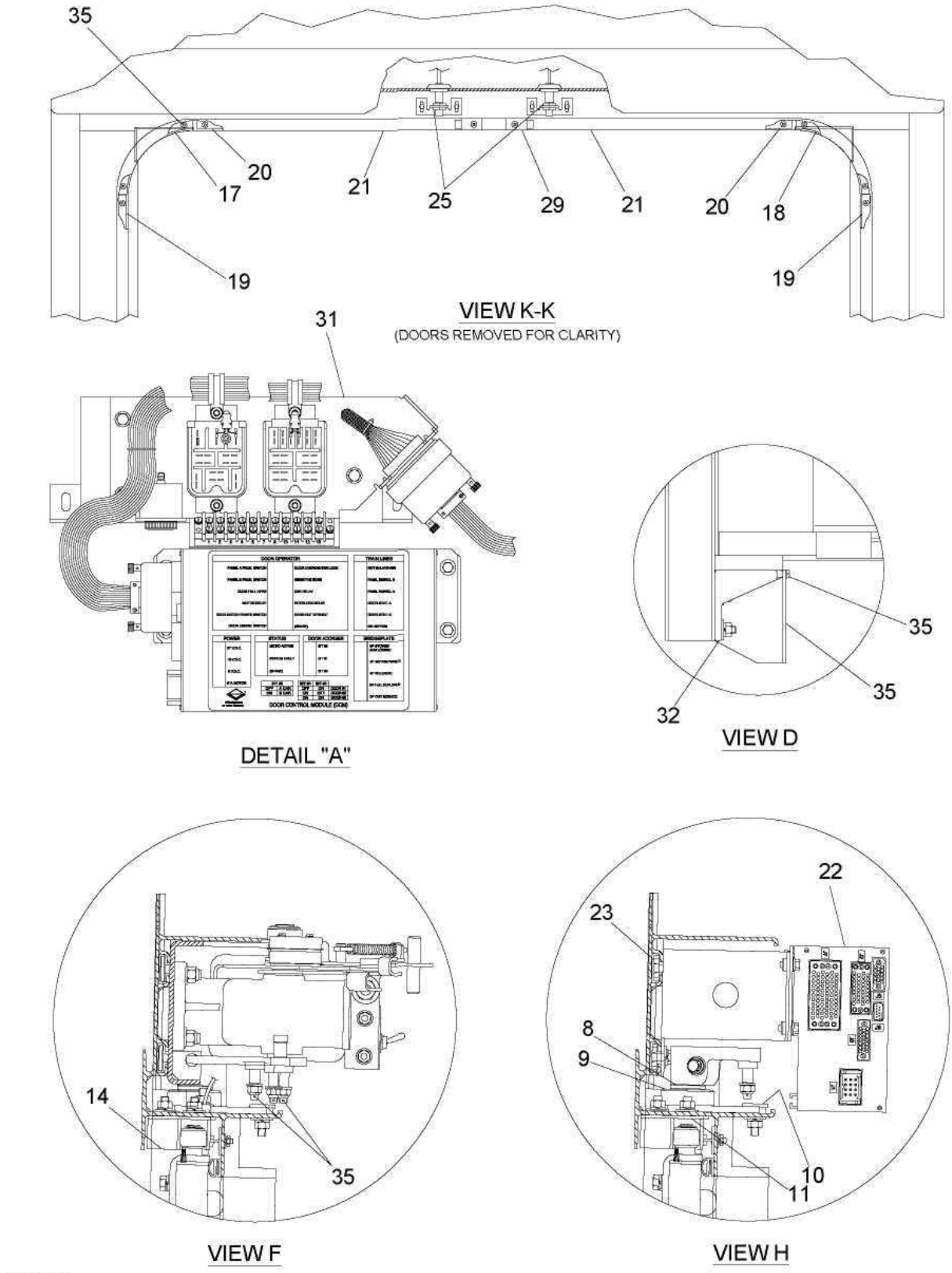

Figure 4-2.43 Door Module Components, End Doors (Sheet 3 of 3)

ITEM NO.	PART NAME	QTY	ITEM NO.	PART NAME	QTY
1	Connecting Rod Assembly	1	19	Seal Retainer	2
2	Connecting Rod Assembly	1	20	Seal Retainer	2
3	Door Shaft Lever Assembly, RH	1	21	Face Seal	2
4	Door Shaft Lever Assembly, LH	1	22	Controller and Relay Assembly	1
5	Screw	2	23	Mounting Bar	4
6	Wedge	2	24	End Door Operator Assembly	1
7	Wedge	2	25	Sensor Assembly	2
8	Lever Spacer	2	26	Door Panel Assembly, RH	1
9	Bearing	2	27	Door Panel Assembly, LH	1
10	Mounting Plate	2	28	Bottom Pivot Assembly	2
11	Mounting Plate	2	29	Transition Seal	1
12	Bearing Plate Assembly, RH	1	30	Door Frame Assembly	1
13	Bearing Plate Assembly, LH	1	31	Relay Bracket Assembly	1
14	Roller Channel Assembly, RH	1	32	Pivot Bracket	1
15	Roller Channel Assembly, LH	1	33	Pivot Bracket	1
16	Locking Wedge	1	34	Identification Label	1
17	Corner Seal Retainer, RH	1	35	Hardware Kit	1
18	Corner Seal Retainer, LH	1	36	Identification Label	1

b) Manual Release Disassembly

General Disassembly Instructions

During scheduled overhauls, remove and discard the following parts and replace them with new:

- Threaded fasteners
- Bushings
- Spring
- Rollpins
- Dowel pin

i) Manual Release Disassembly procedure

Refer to Figure 4-2.44. Manual Release Assembly. Complete disassembly of the manual release assembly as described below and as shown in Figure 4-2.44.

1. Hold the square end of the cable mount pin (4) with an adjustable wrench and remove the nut (6) and washer (7).
2. Pull the cable mount pin from the pin bore. This frees the flanged bearings (8).
3. Using a mild steel drift, drive the dowel pin (9) from the manual release housing (2) and the manual release handle (10). This frees four washers (11).
4. Remove two screws (12) and the spring (13).
5. Remove the snap bushing (5) from the manual release housing (2).
6. Using a mild steel drift, drive the rollpin (14) from the manual release housing.

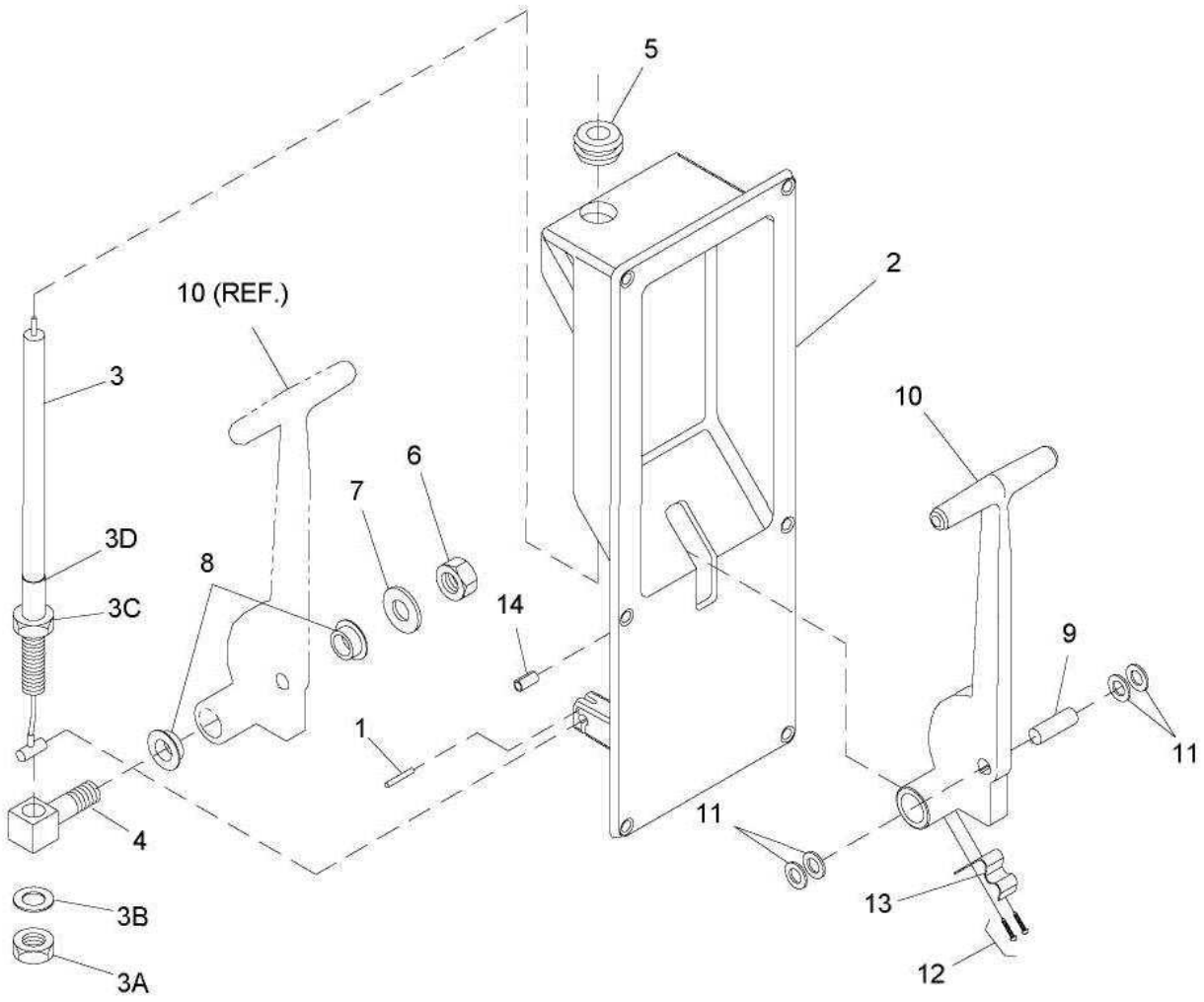

Figure 4-2.44. Manual Release Assembly

ITEM NO.	PART NAME	QTY	ITEM NO.	PART NAME	QTY
	Manual Release Assembly	Ref			
1	Rollpin	1	6	Locking Nut	
2	Manual Release Housing	1	7	Plain Washer	1
3	Release Cable Assembly	Ref	8	Flanged Bearing	2
3A	Hex Nut	Ref	9	Dowel Pin	1
3B	Washer	Ref	10	Manual Release Handle	1
3C	Washer	Ref	11	Washer	4

3D	Hex Nut	Ref	12	Button Head Screw	2
4	Cable Mount Pin	1	13	Lever Spring	1
5	Snap Bushing	1	14	Rollpin	1

ii) Manual Release cable Disassembly procedure

The manual release cable is replaced at overhaul. This section does not apply.

4-2.1.4.e Cleaning/painting

- **Reference Information.**
  1. Tools / Equipment.
     – MBTA approved Cleaning Tools / Equipment (commercial).
  2. Material.
     – MBTA approved Cleaning Products (commercial) (Refer to Section 1 Table 1-9).

a) Cleaning

iii) Manual Release Assembly Component Cleaning

Clean the manual release assembly components to allow inspection as defined in Table 4-2.25.

After cleaning, inspect all components to protect them from corrosion, and apply light coat of protective oil to ferrous part that are not protected by plating or black oxide

Table 4-2.25. Manual Release Assembly Component Cleaning Instructions

FIGURE AND ITEM	PART NAME	CLEANING METHODS AND MATERIALS
Figure 4-2.44-2	Manual release housing	Clean with a nonvolatile, residue free solvent; air blow dry.
-4	Cable mount pin	
-10	Manual release handle	
-13	Lever spring	

iv) Manual Release Cable Cleaning

If the manual release cable is to be reused, clean the manual release cable as described in Table 4-2.26.

CAUTION: **DO NOT SOAK THE RAG WITH SOLVENT. DO NOT ALLOW THE SOLVENT TO WICK ALONG THE CABLE AND ENTER THE CABLEHOUSING. SOLVENT IN THE CABLE HOUSING WILL THIN OR REMOVE THE LUBRICATION, INCREASING THE FRICTION BETWEEN THE CABLE AND HOUSING. IT CAN ALSO INCREASETHE POSSIBILITY OF CORROSION**

Table 4-2.26 Manual Release Cable Assembly Component Cleaning Instructions

FIGURE AND ITEM	PART NAME	CLEANING METHODS AND MATERIALS
Figure 4-2.44-3	Cable and housing	Moisten a clean, lint-free cloth with a nonvolatile, residue free solvent and wipe the housing and cable ends clean of excess lubricant and accumulated dirt.
	Manual release cable components	Clean components removed from the manual release cable assembly in a suitable solvent. Air blow dry and protect from corrosion.

4-2.1.4.f Inspection

- **Reference Information.**
  1. Tools / Equipment (Not Applicable).
     – MBTA Carhouse Standard Tools Kit.
  2. Material (Not Applicable).

v) Manual Release Assembly Component Inspection

Inspect the manual release assembly components in accordance with the specific instructions provided in Table 4-2.27, below.

Table 4-2.27. Manual Release Assembly Component Inspection Methods and Criteria

FIGURE AND ITEM	PART NAME	INSPECTION METHODS AND CRITERIA
Figure 4-2.44-2	Manual release housing	Visually inspect for wear and corrosion; replace if worn or corroded.
-4	Cable mount pin	
-10	Manual release handle	
-13	Lever spring	

vi) Manual Release Cable Inspection

If the manual release cable is not to be replaced, inspect according to Table 4-2.28.

Table 4-2.28. Manual Release Cable Assembly Inspection Methods and Criteria

FIGURE AND ITEM	PART NAME	INSPECTION METHODS AND CRITERIA
Figure 4-2.44-3	Manual release cable and housing Manual release cable end fitting components	Visually inspect for wear and corrosion; replace if worn or corroded.

4-2.1.4.g Repair (Not applicable)

4-2.1.4.h Reassembly

- **Reference Information.**
  1. Tools / Equipment.
     – MBTA Overhaul Standard Tools Kit.vv
  2. Material (Not Applicable).
- **Procedure**

a) Reassembly

vii) Reassembly of Manual Emergency Release Mechanism

Refer to Figure 4-2.44. Manual Release Assembly. Assemble the manual release assembly as described below.

1. Press the rollpin (14) into the manual release housing (2). The ends of the pin must be flush with or below the surface of the housing.
2. Attach the spring (13) to the manual release handle (10), using two screws (12). Tighten the screws to 10 ±1 inch pounds.
3. Position the manual release handle and four washers (11) in the manual release housing. Align the dowel pin holes in the handle and housing and press the dowel pin (9) into the housing. The ends of the pin must be flush with or below the surface of the housing.
4. Insert two flanged bearings (8) into the manual release handle.
5. Insert the cable mount pin (4) into the manual release handle. Hold the pin with an adjustable wrench, and place the washer (7) and nut (6) on the cable mount pin. Tighten the nut.
6. Insert the snap bushing (5) into the manual release housing.
7. Check the manual release handle movement. The manual release handle must move freely.

viii) Reassembly of Manual release cable assembly

The manual release cable assembly cannot be disassembled or overhauled. At normal overhaul, it will be replaced.

b) Installation

i) Installation of Manual Emergency Release Mechanism

Refer to Figure 4-2.44. Manual Release Assembly. Install the manual release assembly on the car as described below.

1. Remove the two nuts (3A and 3D) and two washers (3B and 3C) from the end of the manual release cable (3). Feed the manual release cable through the snap bushing (5).
2. Install one nut (3D) and one lockwasher (3C) on the threaded fitting at the end of the cable housing. Turn the nut to the top of the threads.
3. Position the manual release assembly at its installation site and slide the cable fitting through the cable mounting pin (4).
4. Install the remaining lockwasher (3B) and nut (3A) onto the threaded end of the manual release cable (3).
5. Insert the cable T-end into the T-slot in the manual release housing (2) and secure it with a new rollpin (1).

6. Turn the bottom nut up toward the cable mount pin until the cable mount pin is approximately centered in the threaded area. Turn the top nut down to lock the cable in position. Tighten the nuts.
7. Tip the manual release assembly into position in the car body. Attach the assembly using the carbuilder hardware. Tighten the mounting hardware according to the carbuilder specification.

ii) Installation of manual release cable

Installation of manual release cable is same as installation of Manual Emergency Release Mechanism

4-2.1.4.i Adjustment/Test

a) Adjustment

i) Adjustment of Manual Release Assembly.

Refer to Figure 4-2.44. Manual Release Assembly. Install the manual release assembly on the car as described below.

Turn the bottom nut up toward the cable mount pin until the cable mount pin is approximately centered in the threaded area. Turn the top nut down to lock the cable in position. Tighten the nuts.

Tip the manual release assembly into position in the car body. Attach the assembly using the car builder hardware. Tighten the mounting hardware according to the car builder specification

ii) Manual Release Cable Assembly

If necessary, the manual release cable installation can be adjusted as described below.

1. If the doors do not unlock and open when the manual release handle is actuated, adjust the installation as follows.
2. Check the cable routing and mounting to assure it is correct, and verify that the cable bend radius is not less than 3.5 inches.
3. Loosen the nuts on the cable end at the manual release end. Move the nuts higher on the manual release cable.
4. If the doors do not completely close and lock when the manual release handle and the overhead emergency handle are in the NORMAL position, adjust the installation as follows.
5. Check the cable routing and mounting to assure it is correct, and verify that the cable bend radius is not less than 3.5 inches
6. Loosen the nuts on the cable end at the manual release end. Move the nuts lower on the manual release cable.

7. If the emergency release force is too high, verify that the cable routing and mounting is correct and that the cable bend radius is not less than 3.5 inches.

b) Bench Test

(A) Bench Test

i) Manual Release Assembly

No bench test is required.

ii) Manual Release Cable Assembly

No bench test is required

(B) On-Car Testing

i) Manual Release Assembly

a) Outside Emergency Release

1. Using the crew key, open the outside emergency release door.
2. Pull the emergency release handle. The car doors must unlock and open far enough that they can be opened by hand.
3. Close the doors, making sure the doors are completely closed and locked.
4. Attach the pull tester tool to the manual release handle.
5. Pull on the tester with an even pressure at a downward angle of approximately 45 degrees as the handle begins to deploy. Try to ensure an angle of 90 degrees between the handle and the tester direction. As the handle clears the housing change the pull angle to as close to straight downward as possible. Apply steady downward pressure until the doors unlock and open slightly.
6. Observe the pull tester. The correct reading point is when the doors unlock and open slightly.
7. Open the doors completely by hand.
8. Return the manual release handle to the stowed position.
9. Grasp the doors at the window inner seal and move the doors to the closed position by hand.
10. Return the overhead emergency release handle to the NORMAL position.

11. The pass criteria for this test is as follows:
    - When the manual release handle is pulled the doors must unlock and open slightly, and must be able to opened completely by hand.
    - The force to unlock and slightly open the doors, as read on the pull tester, must not exceed 60 pounds.
    - When the overhead emergency release handle has been returned to the NORMAL position, the doors must be completely closed and locked.

b) Inside Emergency Release

1. Pull the inside emergency release handle. The car doors must unlock and open far enough that they can be opened by hand.
2. Close the doors, making sure the doors are completely closed and locked.
3. Attach the pull tester tool to the manual release handle.
4. Pull on the tester with an even pressure at a downward angle of approximately 45 degrees as the handle begins to deploy. As the handle clears the housing change the pull angle to as close to straight downward as possible. Apply steady downward pressure until the doors unlock and open slightly.
5. Observe the pull tester. The correct reading point is when the doors unlock and open slightly.
6. Open the doors completely by hand.
7. Return the manual release handle to the stowed position.
8. Grasp the doors at the window inner seal and move the doors to the closed position by hand.
9. Return the overhead emergency release handle to the NORMAL position.
10. The pass criteria for this test is as follows:
    - When the manual release handle is pulled the doors must unlock and open slightly, and must be able to opened completely by hand.
    - The force to unlock and slightly open the doors, as read on the pull tester, must not exceed 60 pounds.
    - When the overhead emergency release handle has been returned to the NORMAL position, the doors must be completely closed and locked.

ii) Manual Release Cable Assembly

With the car doors prepared for operation, actuate the manual release handle. Check the operation of the manual release mechanism as follows:

1. Verify that the doors release and can be opened by hand.
2. Fully open the car doors.
3. Close the car doors and reset the manual release handle manually.
4. Verify that the doors are completely closed, and that the correct door and train operating signals are present.

4-2.1.5 Door Out-Of-Service Mechanism

4-2.1.5.a Description & Operation

Each Door Module assembly is equipped with the Door Out-Of-Service Mechanism used to remove a door from service. Before to set the door to the Out-Of-Service condition, the related door must be set in the DOOR CLOSED AND LOCKED position. The door out-of-service mechanism is a 2-position, lever operated mechanism. It is installed with the door operator above the door header and behind the door operator closeout panel.

The door motor power toggle switch, also mounted on the door operator, must be opened when the door is removed from service. This prevents the motor from being powered while the door is out of service. During normal operation, the door out-of-service lever is in the normal position, and is not engaged with the door operating linkage.

Moving the door out-of-service lever from the NORMAL to the DOOR OUT-OF-SERVICE position moves the teeter past the overcenter position and locks the door closed. If the doors are at or near the fully open position, move them by hand to a partially closed position. Then, use the door out-of-service lever to close and lock the door. Also place the DOOR MOTOR POWER SWITCH in the OFF position.

In the DOOR OUT-OF-SERVICE position, a cam on the door out-of-service lever contacts and opens a double-pole, double-throw switch in the motor power circuit. This removes power from the door operator motor, provides a door out-of-service signal to the trainline, and disables the external door switches.

If an interior or exterior manual release is actuated when the door out-of-service mechanism is engaged, the manual release disengages the door out-of-service mechanism from the teeter linkage. This allows the door to be opened manually.

4-2.1.5.b Specific Safety Precautions

For Specific Safety Precautions refer 4-2.b

4-2.1.5.c Fault/Isolation

Refer 4-2.c for fault /isolation of door out of service mechanism

4-2.1.5.d Disassembly

- **Reference Information.**
  1. Tools / Equipment.
     - MBTA Overhaul Standard Tools Kit.vv
  2. Material (Not Applicable).
- **Procedure**

a) Removal of Door Out of Service Mechanism

Remove the door out-of-service assembly for heavy maintenance according to the instructions in paragraph 4-2.1.2.d b)

b) Disassembly of Door Out of Service Mechanism

During scheduled overhauls, remove and discard the following parts and replace them with new:

- all attaching parts
- all springs
- all switches
- all retaining rings

Refer to Figure 4-2.45. Door Out-of-Service Assembly. Disassemble the door out-of-service assembly as described below.

1. Remove the toggle (1), compression spring (2), and plain washer (3). Discard the spring and washer.
2. Remove two Sem screws (5), two plain washers (6), and the circuit breaker (4).
3. Remove two nuts (8), two lock washers (9), and two plain washers (10). Remove the left-hand switch and bracket (7).
4. Remove the Faston tabs (11) from the switch push on connectors.
5. Remove two nuts (13), two lockwashers (14), and two plain washers (15). Remove the right-hand switch and bracket (12).

6. Remove the Faston tabs (16) from the switch push on connectors.
7. Remove the switch mounting plate (17) by removing two hex nuts (18), lock washers (19), and plain washers (20).
8. Remove the tie mount (21) by removing the hex nut (22) and plain washer (23). Remove the harness tie (24) from the tie mount.
9. Remove the loop clamp (25) and switch mounting plate (26) by removing two nuts (27), two lockwashers (28), and two plain washers (29).
10. Remove two retaining rings (30) and washers (31). Remove the pivot pin (32). This frees the torsion spring (33), spacer (34), washer (35), and handle (36).
11. If the grip (37) is worn, remove it from the handle.
12. Press the rollpin (38) from the lever assembly (39) and cam and hub (40). Remove the lever assembly and cam and hub assembly from the mounting bracket (41)
13. Remove the spacers (42) and nylon bearings (43).
14. Do not remove the identification labels (44, 45, and 46) unless illegible or damaged.

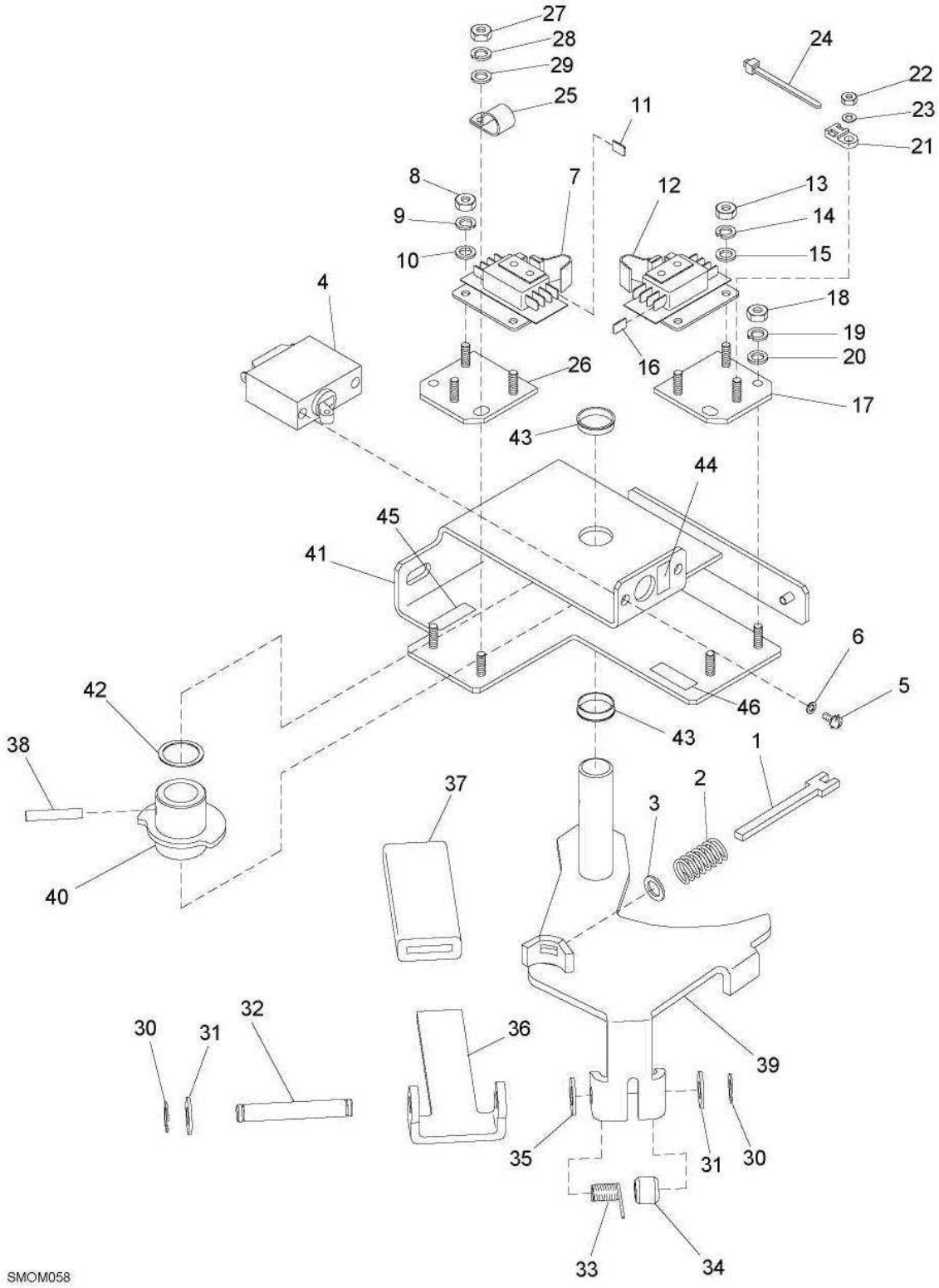

Figure 4-2.45. Door Out-of-Service Assembly

ITEM NO.	PART NAME	QTY	ITEM NO.	PART NAME	QTY
	Door Out-of-Service Assembly	Ref			
1	Toggle	1	24	Harness Tie	1
2	Compression Spring	1	25	Loop Clamp	1
3	Plain Washer	1	26	Switch Mounting Plate	1
4	Circuit Breaker (CB1)	1	27	Hex Nut	2
5	Sem Screw	2	28	Lockwasher	2
6	Plain Washer	2	29	Plain Washer	2
7	Left-hand Switch and Bracket Assembly	1	30	Retaining Ring	2
8	Hex Nut	2	31	Washer	2
9	Lockwasher	2	32	Pin	1
10	Plain Washer	2	33	Torsion Spring	1
11	Faston Tab	AR	34	Spacer	1
12	Right-hand Switch and Bracket Assembly	1	35	Washer	1
13	Hex Nut	2	36	Handle	1
14	Lockwasher	2	37	Grip	1
15	Plain Washer	2	38	Rollpin	1
16	Faston Tab	AR	39	Lever Assembly	1
17	Switch Mounting Plate	1	40	Cam and Hub	1
18	Hex Nut	2	41	Mounting Bracket	1
19	Lockwasher	2	42	Spacer	AR
20	Plain Washer	2	43	Nylon Bearing	2
21	Tie Mount	1	44	Identification Label	1
22	Hex Nut	1	45	Identification Label	1
23	Lockwasher	1	46	Identification Label	1

4-2.1.5.e Cleaning/Painting

- **Reference Information.**
  1. Tools/Equipment.
     - MBTA approved Cleaning Tools / Equipment (commercial).
  2. Material.
     - MBTA approved Cleaning Products (commercial) (Refer to Section 1 Table 1-9).

  Clean the door out-of-service components to allow inspection as defined in Table 4-2.29.

  After cleaning, inspect all components to protect them from corrosion, and apply light coat of protective oil to ferrous part that are not protected by plating or black oxide

Table 4-2.29. Door Out-of-Service Component Cleaning Instructions

FIGURE AND ITEM	PART NAME	CLEANING METHODS AND MATERIALS
Figure 4-2.45-1	Toggle	Clean with a. nonvolatile, residue free solvent; air blown dry. Protect from corrosion after cleaning.
-17	Switch mounting plate	
-26		
21	Tie mount	
-32	Pivot pin	
-34	Spacer	
-36	Handle	
-39	Lever assembly	
-40	Cam and hub assembly	
-41	Mounting bracket assembly	
-42	Spacer	
-44 -45 -46	Identification label	Clean with a lint-free rag moistened with a nonvolatile, residue free solvent. Make sure the solvent will not attack the label, loosen the adhesive, nor remove information.

b) Painting (Not applicable)

4-2.1.5.f Inspection

- **Reference Information.**
  1. Tools / Equipment (Not Applicable).
     – MBTA Carhouse Standard Tools Kit.
  2. Material (Not Applicable).

  Inspect the door out-of-service components in accordance with the specific instructions provided in Table 4-2.30.

Table 4-2.30. Door Out-of-Service Component Inspection Methods and Criteria

FIGURE AND ITEM	PART NAME	INSPECTION METHODS AND CRITERIA
Figure 4-2.45-1	Toggle	Visually inspect for deformation, corrosion, excessive wear, and visible damage; replace as necessary
-17 -26	Switch mounting plate	
21	Tie mount	
-32	Pivot pin	
-34	Spacer	
-36	Handle	
-39	Lever assembly	
-40	Cam and hub assembly	
-41	Mounting bracket assembly	
-42	Spacer	
-44 -45 -46	Identification label	Visually inspect for damage and loss of legibility; replace as necessary

4-2.1.5.g Repair (Not Applicable)

4-2.1.5.h Reassembly

- **Reference Information.**
  1. Tools / Equipment.
     – MBTA Overhaul Standard Tools Kit.
  2. Material (Not Applicable).
- **Procedure**

a) Reassembly

Reassemble the door out-of-service assembly as shown in Figure 4-2.45. Tighten all threaded fasteners to the torque value specified in the assembly step.

NOTE: If the switch mounting plates was removed, the switch position may require adjustment when the door out-of-service assembly is installed on the door operator assembly. Switch position adjustment is accomplished by moving the mounting plates as necessary. Instructions for adjusting the switch position will be provided with the instructions for the door operator assembly.

1. If any of the identification labels (44, 45, and 46) was removed, make sure the location where the label will be placed is free of oil, and is clean and dry. Peel the protective backing from the label, position it, and press it in place. Press from the center to the outer edges to make sure there are no air bubbles beneath the identification foil.
2. Press the flanged nylon bearings (43) into the mounting bracket assembly (41).
3. Position the spacers (42) with the cam and hub assembly (40) in the mounting bracket (41). Insert the shaft on the lever assembly (39) through the bore in the lever and hub.
4. Align the pin holes in the cam and hub assembly and the shaft on the lever assembly. Press the rollpin (38) into the pin bore. The pin should protrude equally on both sides of the cam and hub assembly.
5. Slide a new grip (37) onto the handle (36). Place the handle over the mounting angles on the lever assembly (39).
6. Insert the pin (32) through one washer (35) oriented, and then through the handle and the mounting angle on the lever assembly (39). Feed the torsion spring (33) onto the pin. The spring must be oriented with the drive tang side of the spring against the handle and lever.

7. Insert the pin through the spacer (34) and the opposite mounting angle. Place one washer (31) and one retaining ring (30) over each end of the pin (32)
8. Place the right-hand switch mounting plate (17) over the studs on the mounting bracket (41). Install one washer (20), one lockwasher (19) and one hex nut (20) on each stud. Tighten the nuts to 19 ± 1 inch pounds.
9. Place the left-hand switch mounting plate (26) over the studs on the mounting bracket (41). Install one loop clamp (25), one washer (29), one lockwasher (28), and one hex nut (27) on its stud.Install one washer (29), one lockwasher (28), and one hex nut (27) on the remaining stud. Tighten the nuts to 19 ± 1 inch pounds.
10. Place the right-hand switch and bracket (12) over the studs on the switch mounting plate (17). Install two washers (15), two lockwashers (14) and two hex nuts (13) over the studs. Tighten the hex nuts to 19 ± 1 inch pounds.
11. Place the tie mount (21) on the stud on the switch mounting plate (17) and secure it with one plain washer (23) and one Keps nut (22).
12. Place the left-hand switch and bracket (7) over the studs on the switch mounting plate (26). Install two washers (10), two lockwashers (9) and two hex nuts (8) over the studs. Tighten the hex nuts to 19 ± 1 inch pounds.
13. Place the switch toggle on circuit breaker (4) through the lip on the mounting bracket (41). Secure the circuit breaker with two plain washers (6) and two Sem screws (5). Tighten the screws to 10 ± 1 inch pounds.
14. Place the compression spring (2) and the washer (3) onto the toggle (1). Insert the togglethrough the toggle slot on the mounting bracket.

b) Installation

Install the door-out-of-service assembly on the door operator assembly as described in 4-2.1.2.h a) and as shown in Figure 4-2.38. Door Operator Door Out-of-Service Assembly

4-2.1.5.i Adjustment/Test

a) Adjustment

NOTE: Adjust and verify only when required – after an accident or during major repair.*

1. Loosen the two nuts and screw securing the Door Out-Of-Service (DOOS) assembly to the base plate and switch plate respectively.
2. With the teeter lever in the fully closed position contacting the nylon bumper, rotate the teeter lever 25° ± 2° towards the opening direction.

3. Adjust the position of the DOOS assembly relative to the teeter lever so that, when actuated, the DOOS lever will engage the plastic roller on the teeter lever assembly.
4. Tighten the two nuts securing the DOOS assembly to the base plate. Tighten the screw securing it to the switch plate.
5. With the teeter lever 30° from the fully closed position, slowly actuate the DOOS lever. Verify that the DOOS1 switch deactivates. Verify that the DOOS lever engages the plastic roller causing the teeter lever to rotate towards the closed direction.
6. Rotate the DOOS lever to the out-of-service position. Verify that the DOOS2 switch is actuated. Verify that the teeter lever contacts the nylon bumper on the base plate in this position.
7. Verify that the DOOS lever remains either in the selected “Normal” or “Out-of-Service” positions.
8. Place the DOOS lever in the “Out-of-Service” position. Actuate the manual release (emergency release) lever. Verify that the DOOS lever springs back to its “Normal” position allowing the teeter lever to rotate.

i) Adjustment of Emergency Switches

NOTE: Adjust switches only when required – after an accident or during major repair*

- **Emergency Switches (EMS1, EMS2, and EMS3)**

1. Place the manual release handle (emergency handle) in the normal position. Loosen the two nuts securing the switch-mounting bracket to the door operator switch plate.
2. Insert a .015 inch thick feeler gauge between the switch plungers and the actuating tab on the manual release lever.
3. Push the switches towards the actuating tab until all plungers bottom out against the feeler gauge. With the plungers bottomed, tighten the switch bracket mounting nuts to secure adjustment.
4. Remove the feeler gauge and apply Glyptal to the mounting screws to complete adjustment.

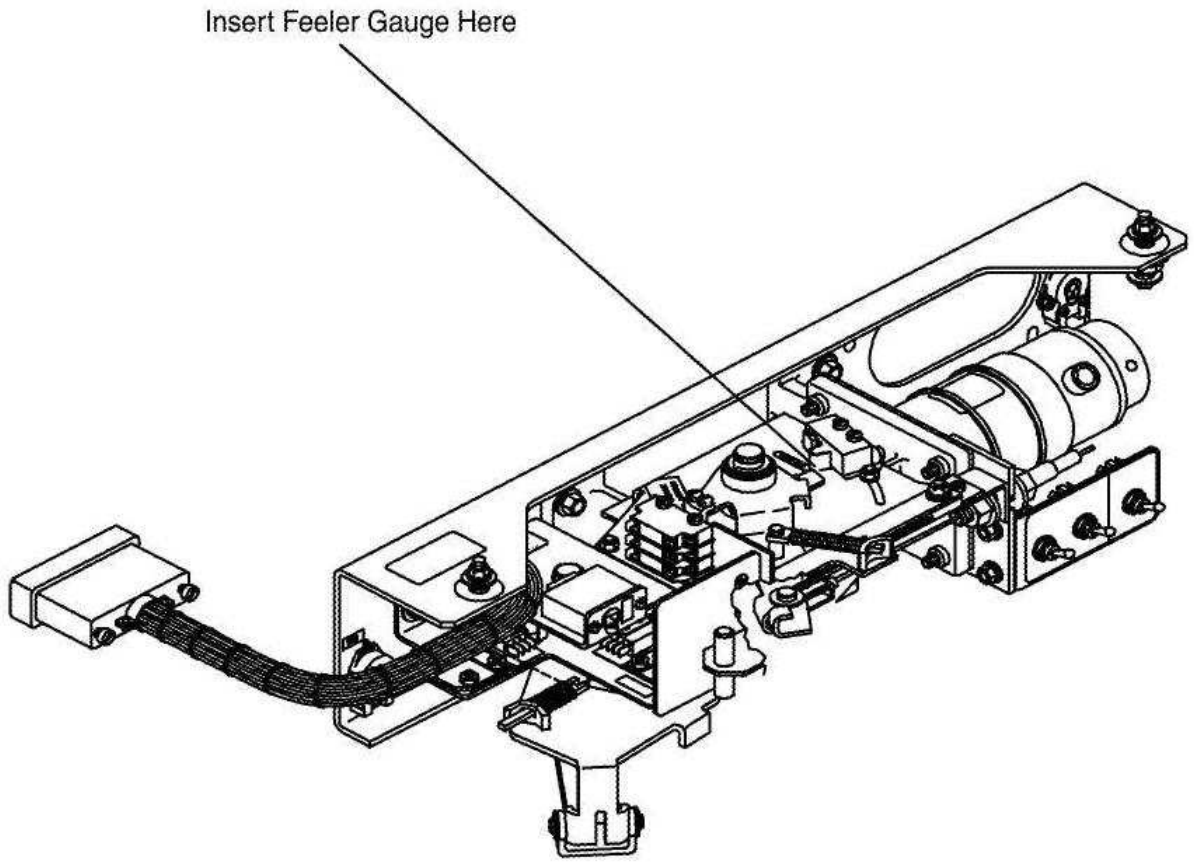

Figure 4-2.46 Overcenter Lock Switch

ii) Adjustment of the Over Center Lock Switch

1. Rotate the teeter lever counter clockwise until it stops against the nylon bumper on the base plate.
2. Loosen the two nuts securing the over center switch mounting bracket to the door operator switch plate.
3. Insert a 0.150 inch feeler gauge between the over center lock switch lever and the nylon cam (refer to Figure 4-2.46).
4. Slide the over center switch and mounting bracket along the slot on the switch plate until the switch bottoms against the nylon cam. Make sure the teeter lever is bottoming against the feeler gauge on the bumper.
5. Torque the switch bracket mounting nuts (17 in-lbs) to secure adjustment.
6. Remove the feeler gauge and apply Glyptal to the switch mounting screws to complete adjustment.

iii) Manual Release Functional Verification *

1. Rotate the teeter lever to the fully closed position and verify that it is making contact with the nylon bumper stop.
2. Place the Manual Release Lever in the “Normal” position. Verify that the Manual Release Lever is actuating switches EMS1, EMS2, and EMS3.
3. Slowly begin to actuate the Manual Release Lever. Verify that switches EMS1 and EMS2 deactivate before the lever contacts the spiral pin on the teeter lever output shaft.
4. Verify that the Manual Release Lever rotates the teeter lever in the open direction at least 30°.
5. Verify that the Manual Release Lever remains in the toggled position in both “Normal” and Emergency” positions.

b) Test

i) Bench Test

Bench check the door out-of-service assembly as described below.

1. Operate the door out-of-service assembly to make sure the mechanism will go overcenter and lock.
2. Using a volt/ohm meter, check that the door out-of-service switches actuate when the door out-of-service assembly is actuated.
3. Using a volt/ohm meter, check that the door power circuit breaker operates when the circuit breaker is opened and closed.

ii) On-Car Testing

For on car testing of Out-Of-Service assembly, Refer to 4-2.1.5.i a)

4-2.1.6 Door Operator Linkage and Support Components

4-2.1.6.a Description & Operation

The door operator is connected to the door assembly through 2 connecting rod assemblies for each operator. The connecting rods attach to the operator on the teeter plate pins. Each connecting rods connects to its door assembly by a pin on the door shaft lever assembly. The connecting rod transfers the teeter plate rotation through its door shaft lever to its door panel.

The door shaft levers have a timed, 10-tooth external spline that mates with the broached, timed, 10-tooth internal spline in the door spline shaft assembly.

This provides specific orientation of the door shaft lever to the door. The adjustment on the connecting rod allows the door panels to be adjusted to exact alignment, closing position, and preload parameters.

The door shaft lever assembly is guided and supported by the door shaft lever bearing assembly that mounts directly to the door module header extrusion.

These are permanently lubricated bearings that carry both thrust and radial loads. They can be adjusted in both the forward/aft and inboard/outboard directions to adjust the face seal preload.

Each folding door pair has a bottom pivot assembly mounted in a support bracket at the door frame threshold. The pivot assemblies use molybdenum impregnated, nylon spherical rollers on a stainless steel pivot to carry the radial loading at the bottom of the door. The pivot assembly is adjustable in the inboard/outboard directions to adjust the face seal preload.

A lower stabilizing wedge made from molybdenum impregnated nylon is mounted to the underside of the threshold extrusion. When the door is closed, the door panel stabilizing brackets engage the stabilizing wedge, securing the bottom leading edge corners of the door panel. The stabilizing wedge is also adjustable in the inboard/outboard directions.

Each stabilizing wedge has a pin protruding downward that contacts the bridgeplate door and prevents the bridgeplate from deploying if the doors are not fully open.

4-2.1.6.b Specific Safety & Precautions

For Specific Safety Precautions refer 4-2.b

4-2.1.6.c Fault/Isolation

Refer Section 4-2.c for fault/isolation of Door Operator Linkage and Support Components

4-2.1.6.d Disassembly

- **Reference Information.**
  1. Tools/Equipment.
     – MBTA Overhaul Standard Tools Kit.vv
  2. Material (Not Applicable).
- **Procedure**

a) Removal of Door Operator to Door linkage & support Assembly

Remove the following door module components as described below (bearing plate assemblies, door shaft lever assemblies, connecting rod assemblies, roller channel assemblies, sensor assemblies, bottom pivot assemblies).

iv) Remove Connecting Rods

Refer to Figure 4-2.43, Door Module Components, End Doors, Figure 4-2.47, Door Module Components, Center Doors, and Figure 4-2.48, Lever Assembly. Remove the connecting rods as described below.

1. Disconnect the connecting rods (1 and 2) from the lever assemblies (4 and 5) by removing one nut (1, Figure 4-2.48) and washer (2) from each rod end pin (3).
2. Disconnect and remove the connecting rods from the teeter plate on the door operator by removing two nuts and washers from the drive posts on the teeter plate.
3. Disassemble connecting rods as described in section 4-2.1.5.d b) step 1.

v) Remove Lever Assemblies

Refer to Figure 4-2.43, Door Module Components, End Doors, Figure 4-2.47, Door Module Components, Center Doors, and Figure 4-2.48, Lever Assembly. Remove the lever assemblies as described below.

1. Remove the connecting rods (1 and 2) as described in step 1, above.
2. Back out the screw (5) securing the locking wedges (6 and 7) in place until the wedges are loosenedenough to pull each lever assembly (3 and 4) from its spline shaft on each door panel.
3. Remove each spacer (8) and bearing (9).

NOTE: Removing the lever assembly completes its disassembly.

vi) Remove Mounting Plates and Bearing Plates

Refer to Figure 4-2.43, Door Module Components, End Doors, and, Figure 4-2.47, Door Module Components, Center Doors. Remove the mounting plates and bearing plates as described below.

1. Remove the two nuts and washers furnished by the carbuilder, and remove each mounting plate (10 and 11).
2. Remove the two nuts and washers furnished by the carbuilder, and remove each bearing plate (12 and 13).

vii) Remove Roller Channels and Brush Seals

Refer to Figure 4-2.43, Door Module Components, End Doors, and, Figure 4-2.47, Door Module Components, Center Doors. Remove the roller channels and brush seals as described below.

1. Remove the carbuilder supplied attaching hardware (nuts and washers) from the captive studs on theroller channel assemblies (14 and 15). Dismount the roller channel assemblies from the car body.
2. Disassemble the roller channels as described in section 4-2.1.d.e b) (iii).

viii) Remove Sensor and Bracket Assembly

Refer to Figure 4-2.43, Door Module Components, End Doors, Figure 4-2.47, Door Module Components, Center Doors, and Figure 4-2.49, Sensor and Bracket Assembly. Remove the sensor and bracket assembly as described below.

1. Remove the jam nut (part of 1, Figure 4-2.49), and remove the toothed washer and the sensor (1) from the bracket assembly (2).
2. Remove the two Keps nuts (4) and plain washers (3), and dismount the bracket assembly (2) from the car body.

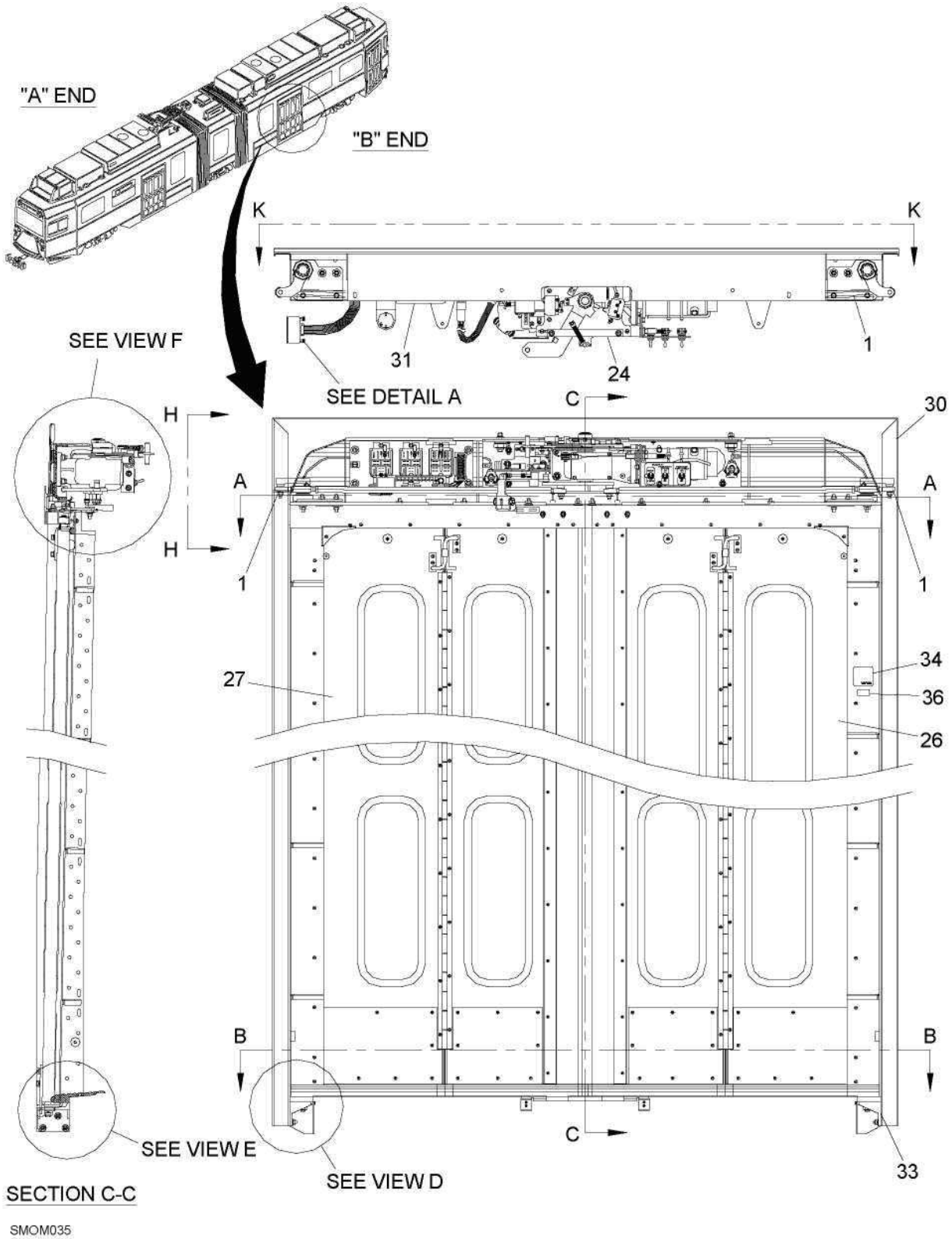

Figure 4-2.47. Door Module Components, Center Doors (Sheet 1 of 3)

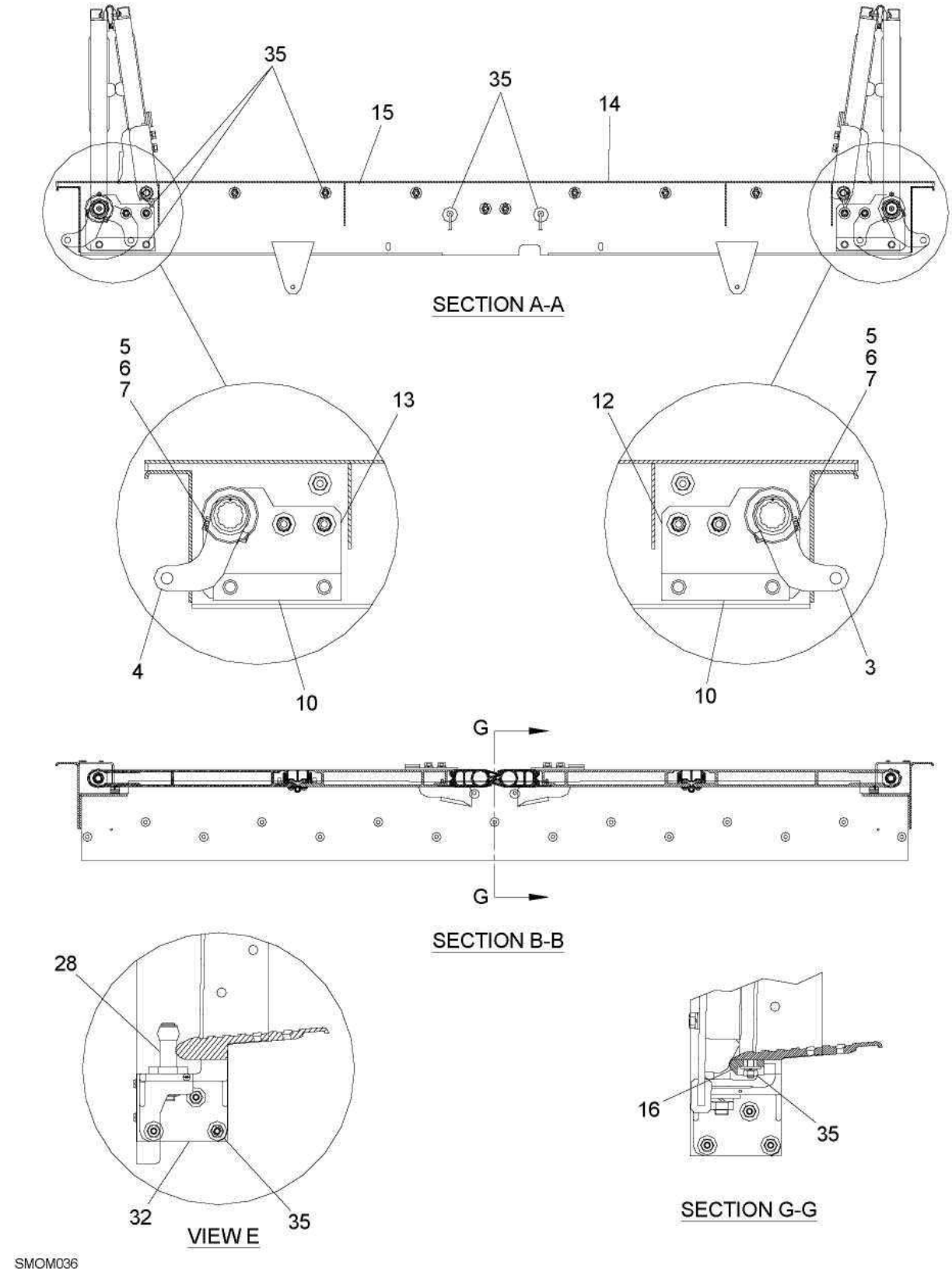

Figure 4-2.47. Door Module Components, Center Doors (Sheet 2 of 3)

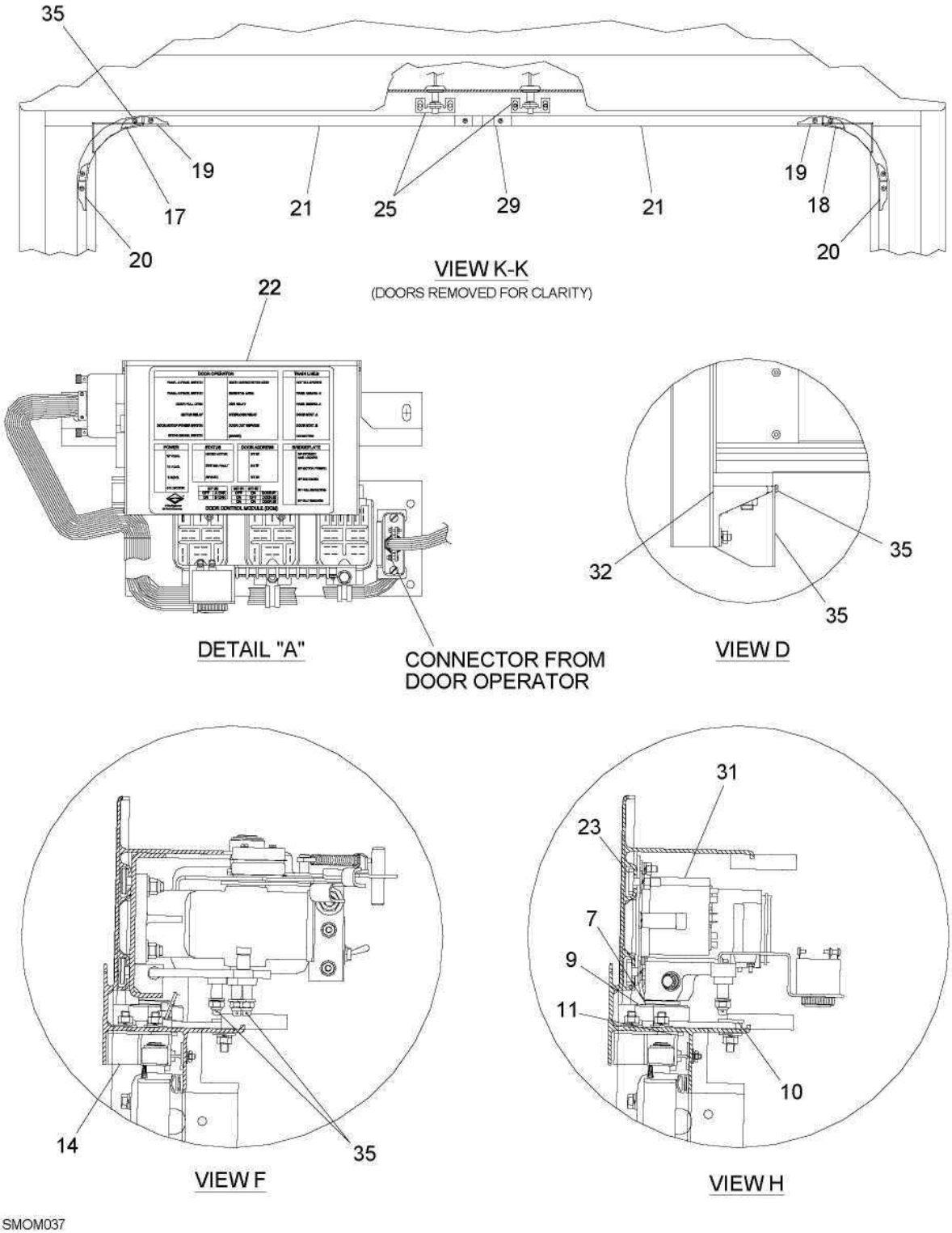

Figure 4-2.47. Door Module Components, Center Doors (Sheet 3 of 3)

ITEM NO.	PART NAME	QTY	ITEM NO.	PART NAME	QTY
1	Connecting Rod Assembly	1	19	Seal Retainer	2
2	Connecting Rod Assembly	1	20	Seal Retainer	2
3	Door Shaft Lever Assembly, RH	1	21	Face Seal	2
4	Door Shaft Lever Assembly, LH	1	22	Controller and Relay Assembly	1
5	Screw	2	23	Mounting Bar	4
6	Wedge	2	24	End Door Operator Assembly	1
7	Wedge	2	25	Sensor Assembly	2
8	Lever Spacer	2	26	Door Panel Assembly, RH	1
9	Bearing	2	27	Door Panel Assembly, LH	1
10	Mounting Plate	2	28	Bottom Pivot Assembly	2
11	Mounting Plate	2	29	Transition Seal	1
12	Bearing Plate Assembly, RH	1	30	Door Frame Assembly	1
13	Bearing Plate Assembly, LH	1	31	Relay Bracket Assembly	1
14	Roller Channel Assembly, RH	1	32	Pivot Bracket	1
15	Roller Channel Assembly, LH	1	33	Pivot Bracket	1
16	Locking Wedge	1	34	Identification Label	1
17	Corner Seal Retainer, RH	1	35	Hardware Kit	1
18	Corner Seal Retainer, LH	1	36	Identification Label	1

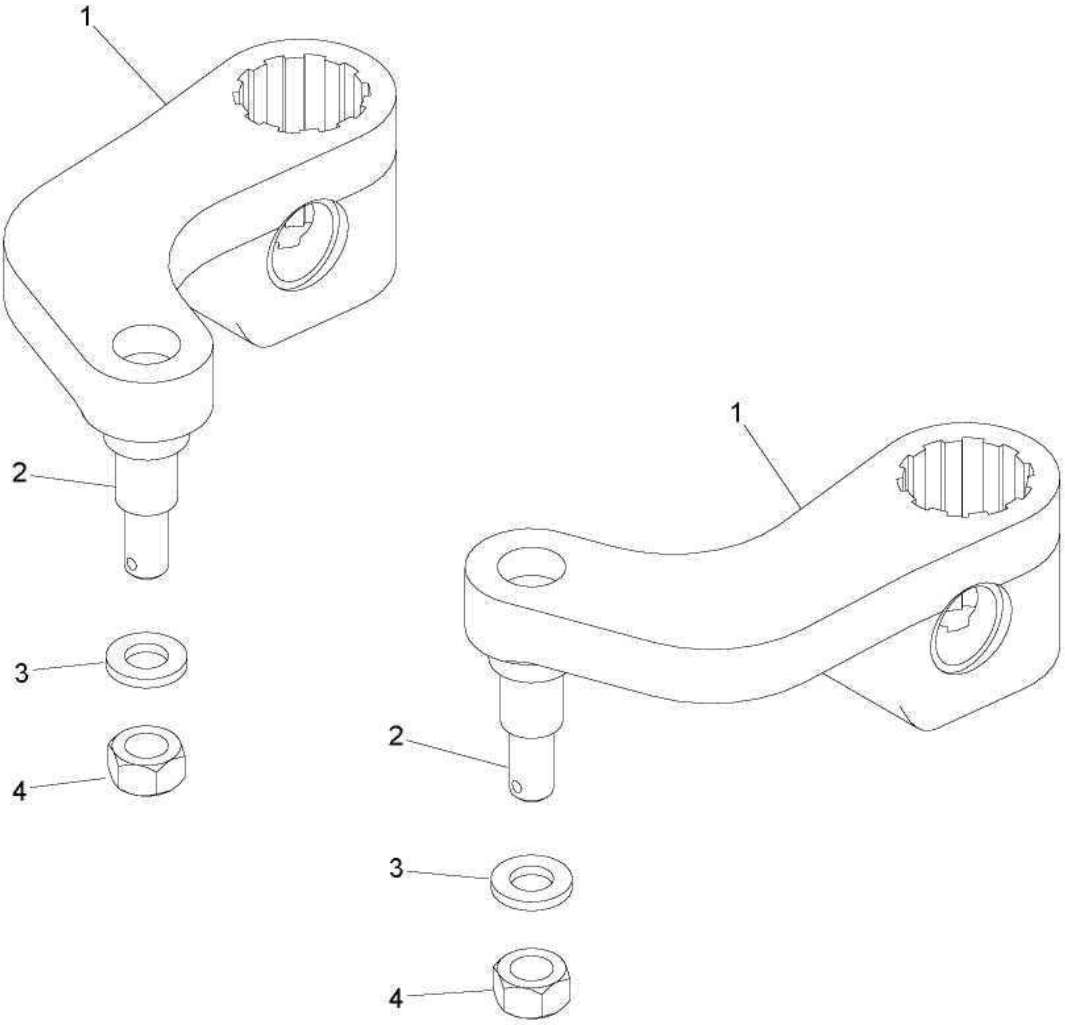

Figure 4-2.48. Lever Assembly

ITEM NO.	PART NAME	QTY	ITEM NO.	PART NAME	QTY
1	Lever		3	Plain Washer	1
2	Pin	1	4	Hex Nut	1

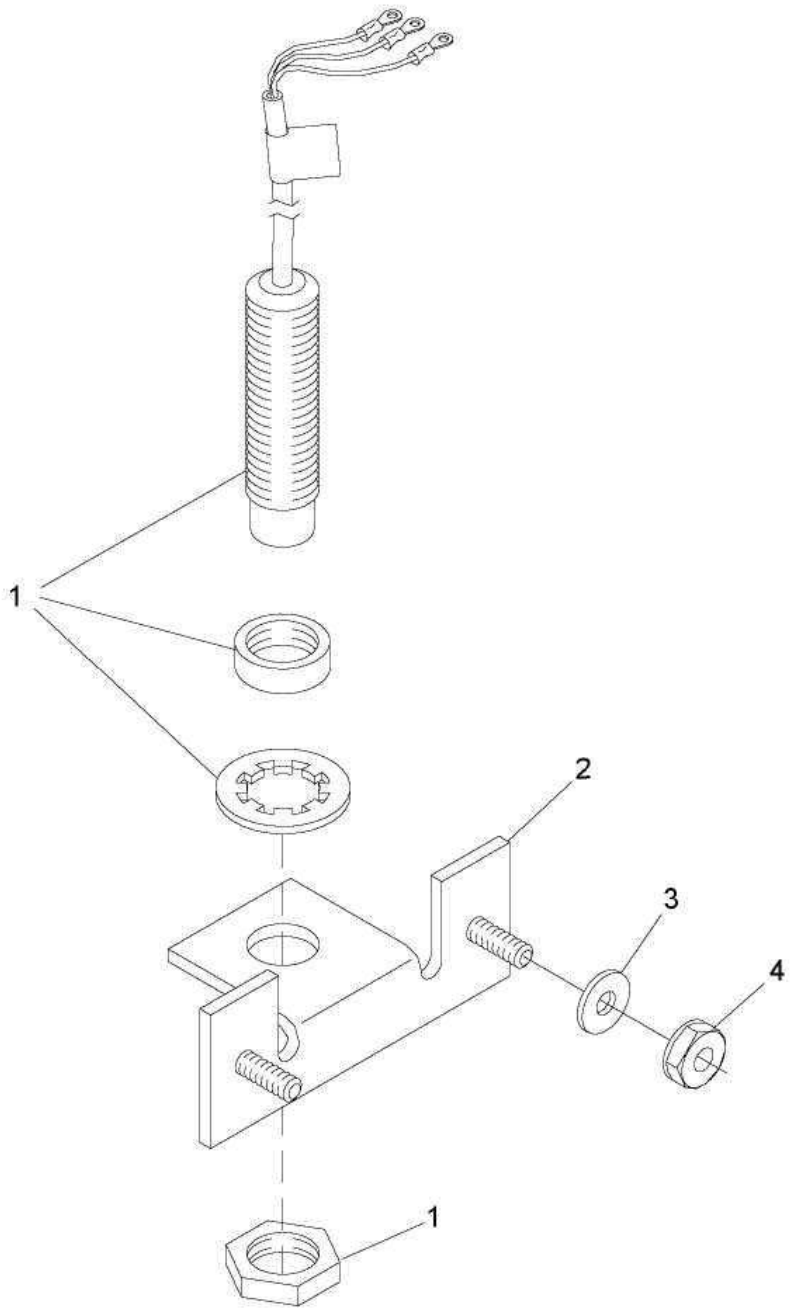

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Figure 4-2.49. Sensor and Bracket Assembly

ITEM NO.	PART NAME	QTY	ITEM NO.	PART NAME	QTY
	Sensor and Bracket Assembly				
1	Sensor (includes jam nuts and toothed washer)	1	3	Plain Washer	2
2	Bracket	1	4	Keps Nut	2

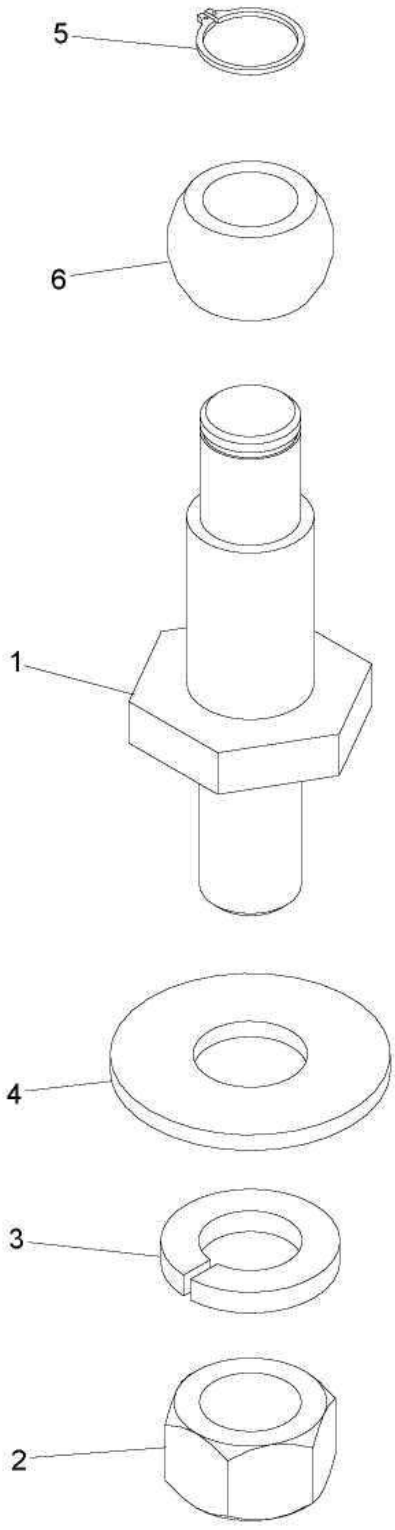

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Figure 4-2.50. Bottom Pivot Assembly

ITEM NO.	PART NAME	QTY	ITEM NO.	PART NAME	QTY
	Bottom Pivot Assembly				
1	Bottom Pivot	1	4	Hardened Washer	1
2	Jam Nut	1	5	Retaining Ring	1
3	Lockwasher	1	6	Spherical Bearing	1

ix) Remove Bottom Pivot Assembly

Refer to Figure 4-2.43, Door Module Components, and Figure 4-2.50. Bottom Pivot Assembly. Remove the bottom pivot assembly (28, Figure 4-2.43 and Figure 4-2.47) as described below.

1. Hold the bottom pivot (1), Figure 4-2.50. Bottom Pivot Assembly) using a 1-1/4-inch open end wrench on the wrenching hex. Remove the jam nut (2), lockwasher (3), and hardened washer (4).
2. Remove the bottom pivot from the car body.
3. Complete the disassembly of the bottom pivot assembly as described in section 4-2.1.5.d b), step 3.

b) Disassembly of Door Operator to Door linkage & support Assembly

Disassemble the door module components that were not disassembled during removal. Refer to Figure 4-2.51.

i) Disassemble Angled Connecting Rod

1. Press out the pin (1), back off the jam nut (2), and remove the rod end bearing (3).
2. Back off the jam nut (4) from the connecting rod (5). Turn the rod end bearing (6) components from the connecting rod (5).
3. Hold the rod end bearing (6) in a soft-jawed vise and back off the jam nut (7). Turn the adjusting coupling (8) from the rod end bearing (6).

ii) Disassemble Straight Connecting Rod

1. Hold the rod end bearing (9) in a soft-jawed vise and back off the jam nut (10). Turn the connecting rod (11) from the rod end bearing (9).
2. Hold the rod end bearing (12) in a soft-jawed vise and back off the jam nut (13). Turn the connecting rod (11) from the rod end bearing (12).

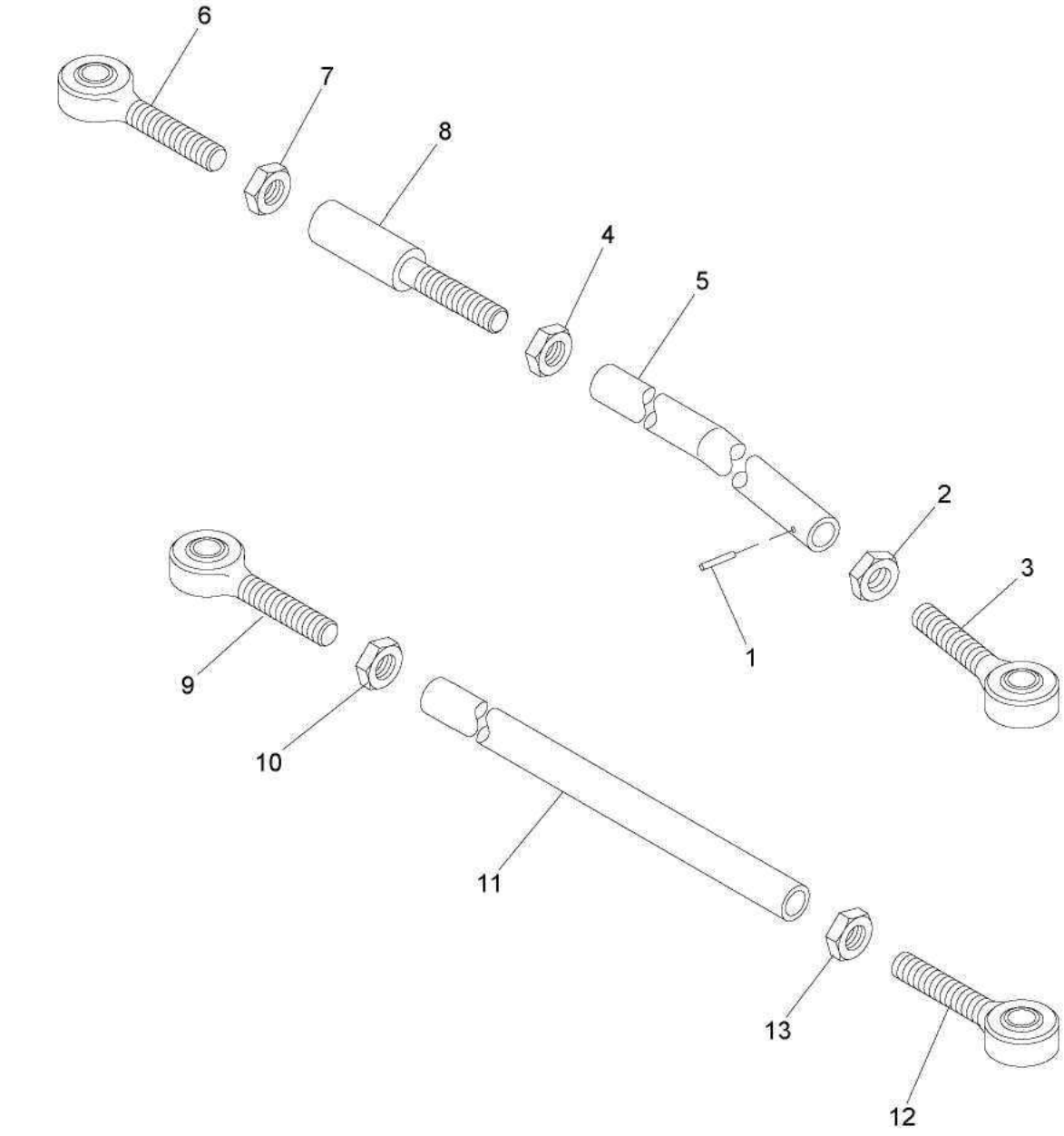

Figure 4-2.51. Connecting Rod Assemblies

ITEM NO.	PART NAME	QTY	ITEM NO.	PART NAME	QTY
	Connecting Rod Assemblies				
1	Rollpin	1	8	Adjusting Coupling	1
2	Jam Nut	1	9	Rod End Bearing	1
3	Rod End Bearing	1	10	Jam Nut	1
4	Jam Nut	1	11	Straight Connecting Rod	
5	Angled Connecting Rod	1	12	Rod End Bearing	
6	Rod End Bearing	1	13	Jam Nut	
7	Jam Nut	1			

iii) Disassemble Roller Channels and Brush Seals

Refer to Figure 4-2.52.

1. Remove the Keps nut (1), plain washers (2), and spacers (3).
2. Remove the brush seal (4) from the captive studs on the roller channel (50).
3. Refer to Figure 4-2.50. Bottom Pivot Assembly to complete the disassembly of the bottom pivot assembly. Use external snap ring pliers to remove and discard the external snap ring (5). Remove and discard the spherical bearing (6).

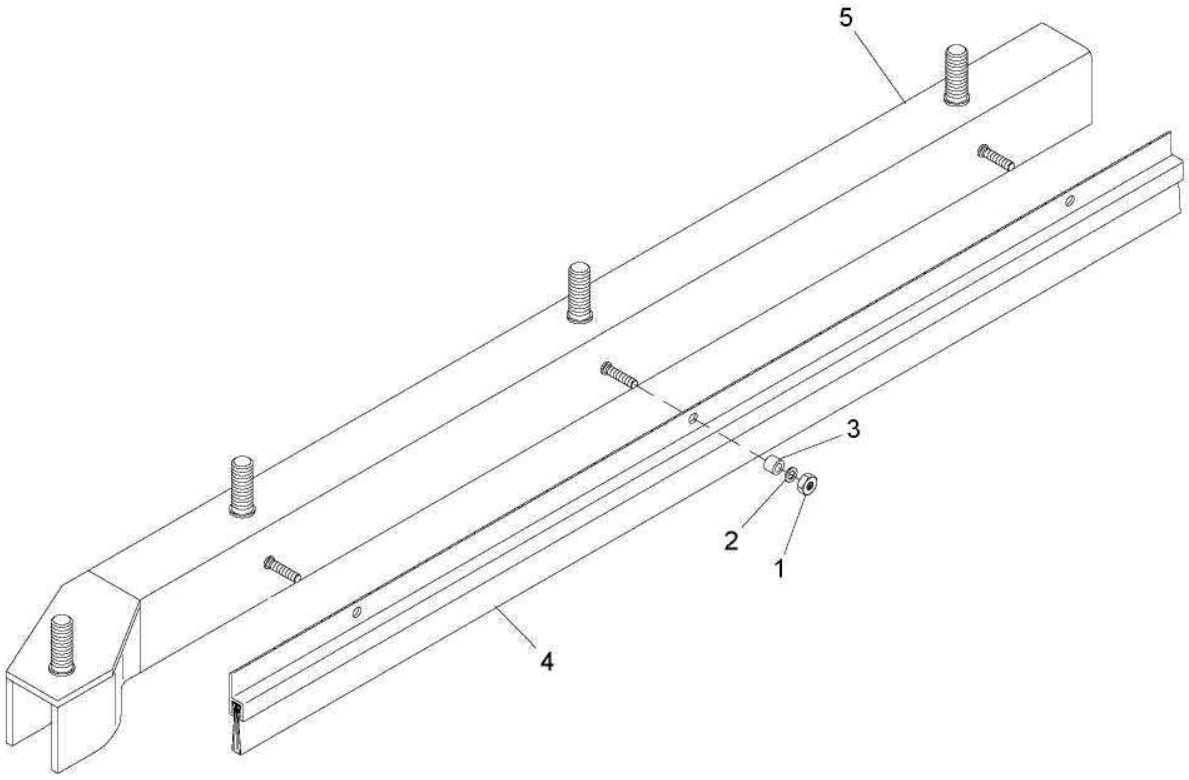

Figure 4-2.52. Roller Channels and Brush Seals

ITEM NO.	PART NAME	QTY	ITEM NO.	PART NAME	QTY
	Roller Channels and Brush Seals				
1	Keps Nut	3	4	Brush Seal	3
2	Plain Washer	3	5	Roller Channel	1
3	Spacer	3			

4-2.1.6.e Cleaning/Painting

- **Reference Information.**
  1. Tools / Equipment.
     – MBTA approved Cleaning Tools / Equipment (commercial).
  2. Material.
     – MBTA approved Cleaning Products (commercial) (Refer to Section 1 Table 1-9).

Clean the door system components as described in Table 4-2.32. Use cleaning products as described in Table 4-2.31. Recommended Cleaning Products.

WARNING: OPEN THE DOOR POWER CIRCUIT BREAKER TO REMOVE POWER FROM THE DOOR SYSTEM COMPONENTS DURING PREVENTIVE MAINTENANCE. POST THE CIRCUIT BREAKER WITH AN "OUT OF SERVICE" PLACARD.

CAUTION: DO NOT USE SOLVENTS TO CLEAN NON-METALLIC PARTS. SOLVENTS CAN ATTACK NON-METALLIC PARTS, CAUSING THEM TO DETERIORATE AND LOSE SERVICE LIFE. USE RECOMMENDED CLEANING PRODUCTS AS LISTED BELOW.

Table 4-2.31. Recommended Cleaning Products

TYPE	NAME	PART NUMBER
Cleaner, Degreaser, Solvent	Simple Green	56140
Stainless Steel Cleaner	Johnson Wax Professional Stainless Steel Cleaner	5277-43
Glass Cleaner	Windex	Windex Blue
Rags	Scott Rags	75260

Clean the door module components according to the instructions in Table 4-2.32, After cleaning, inspect all components. Protect all ferrous components from corrosion with a light coating of oil.

NOTE: **Clean the doorframe in place according to the cleaning note in Table 4-2.32, Door Module Component Cleaning Instructions. Do not remove the door module for cleaning.**

Table 4-2.32. Door Module Component Cleaning Instructions

FIGURE AND ITEM	PART NAME	CLEANING METHODS AND MATERIALS
Figure 4-2.51- 1-2	Connecting rod	Clean, using a residue-free, nonvolatile solvent and clean, lint free cloths. Air blow dry.
-3-4	Lever assembly	
-6-7	Wedge	
-8	Spacer	
-10 -11	Mounting plate	
-12 -13	Bearing plate	
-14 -15	Roller channel assembly	
-16	Locking wedge	
-17 -18 -19 -20	Seal retainer	Clean, using a residue-free, nonvolatile solvent and clean, lint free cloths. Air blow dry.
-22	Controller and relay assembly	Controller and Relay Assembly Cleaning Instructions.
-23	Mounting bar	Clean, using a residue-free, nonvolatile solvent and clean, lint free cloths. Air blow dry.
-24	Door operator	Refer to Table 4-2.23 Door Operator Component Cleaning Instructions.
-25	Sensor assembly	Clean the sensor with a residue-free, nonvolatile solvent on a clean, lint-free rag. Make sure the solvent will not degrade the insulation on the sensor cabling.
-26-27	Door panel	Refer to Table 4-2.19, Door Component Cleaning Instructions.
-28	Bottom pivot assembly	Clean, using a residue-free, nonvolatile solvent and clean, lint free cloths. Air blow dry.
-30	Door frame	Clean, using a residue-free, nonvolatile

FIGURE AND ITEM	PART NAME	CLEANING METHODS AND MATERIALS
		solvent and clean, lint free cloths. Wipe the framework with a solvent moistened rag to remove accumulated oils and dirt. Air blow dry.
Figure 4-2.48- 3	Lever	Clean, using a residue-free, nonvolatile solvent and clean, lint free cloths. Air blow dry.
4-2.49-2	Sensor bracket	
4-2.50-1	Bottom pivot	
-4	Hardened washer	
-3 -6 -9 -12	Rod end bearing	Clean, using a residue-free, nonvolatile solvent and clean, lint free cloths. Air blow dry.
-5 -11	Connecting rod	
-8	Adjusting coupling	Clean, using a residue-free, nonvolatile solvent and clean, lint free cloths. Air blow dry.
Figure 4-2.52- 3	Spacer	
-5	Roller channel	

4-2.1.6.f Inspection

- **Reference Information.**
  1. Tools / Equipment (Not Applicable).
     – MBTA Carhouse Standard Tools Kit.
  2. Material (Not Applicable).

Inspect the door module components according to Table 4-2.33, Inspecting the Door Module Components.

Table 4-2.33. Inspecting the Door Module Components

FIGURE AND ITEM	PART NAME	INSPECTION METHODS AND CRITERIA
Figure 4-2.43- 1 -2	Connecting rod	Visually inspect for deformation, corrosion, excessive wear, and damage; replace as necessary
-3 -4	Lever assembly	
-6 -7	Wedge	
-8	Spacer	
-10 -11	Mounting plate	
-12 -13	Bearing plate	
-14 -15	Roller channel assembly	
-16	Locking wedge	
-17 -18 -19 -20	Seal retainer	
-22	Controller and relay assembly	Refer to Table 4-3.2 Controller and Relay Inspection Methods and Criteria.
-23	Mounting bar	Visually inspect for deformation, corrosion, excessive wear, and damage; replace as necessary
-24	Door operator	Refer to Table 4-2.24, Door Operator Component Inspection Methods and Criteria.
-25	Sensor assembly	Visually inspect for deformation, corrosion, excessive wear, and damage; Inspect the sensor cable for discoloration, which is evidence of overheating. Inspect for brittle cable or wires. Replace, as necessary.
-26 -27	Door panel	Refer to Table 4-2.21, Door Component Inspection Methods and Criteria.

FIGURE AND ITEM	PART NAME	INSPECTION METHODS AND CRITERIA
-28	Bottom pivot assembly	Visually inspect for deformation, corrosion, excessive wear, and damage; replace as necessary
-30	Door frame	1. Visually inspect the framework for deformation. Inspect the frame for denting and bending that will interfere with mounting, operation, and sealing of the doors. If this deformation is found, remove and replace the door module framework. 2. Inspect all deformations for evidence of cracking or metal failure. If cracks or metal failure is evident, remove and replace the door module framework. 3. Visually inspect the door module framework around the mounting hardware holes for evidence of corrosion, cracking, and metal fatigue. If corrosion, cracks, or metal fatigue is evident around the mounting hardware holes, remove and replace the door module framework. 4. Visually inspect the weld areas on the door module framework. Check for evidence of corrosion, cracking, and metal fatigue. If corrosion, cracks, or metal fatigue is evident around the weld areas, remove and replace the door module framework.
Figure 4-2.48-3	Lever	Visually inspect for deformation, corrosion, excessive wear, and damage; replace as necessary
4-5-2	Sensor bracket	
4-6-1	Bottom pivot	
-4	Hardened washer	
Figure 4-2.51-3 -6 -9 -12	Rod end bearing	Visually inspect for deformation, corrosion, excessive wear, and damage Inspect the spherical bearing in the rod end for correct movement. The spherical bearing must move freely, but must not be loose in the rod end. Inspect the threads for

FIGURE AND ITEM	PART NAME	INSPECTION METHODS AND CRITERIA
		deformation and damage. Replace as necessary
-5 -11	Connecting rod	Visually inspect for deformation, corrosion, excessive wear, and damage. Inspect the threads for deformation and damage. Replace as necessary
-8	Adjusting coupling	Visually inspect for deformation, corrosion, excessive wear, and damage. Inspect the threads for deformation and damage. Replace as necessary
Figure 4-2.52-3	Spacer	
-5	Roller channel	

4-2.1.6.g Repair (Not Applicable)

4-2.1.6.h Reassembly

- **Reference Information.**
  1. Tools / Equipment.
     – MBTA Overhaul Standard Tools Kit.
  2. Material (Not Applicable).
- **Procedure**

a) Reassembly of Door Operator Linkage and Support Components

x) Reassemble Bottom Pivot Assembly

Refer to Figure 4-2.50. Bottom Pivot Assembly. Reassemble the bottom pivot assembly as described below.

1. Install the new spherical bearing (6) on the bottom pivot bearing shaft.
2. Secure the bearing with a new external snap ring (5). Use snap ring pliers and install the snap ring with the sharp edge of the retaining ring next to the spherical bearing.
3. Reassembly of the bottom pivot assembly is completed as part of the installation procedure.

xi) Reassemble Roller Channel and Brush Seal

Refer to Figure 4-2.52. Roller Channels and Brush Seals. Reassemble the roller channel and brush seal as described below.

1. Place the brush seal (4) over the captive studs on the roller channel (5).
2. Install 4 new spacers (3), plain washers (2), and Keps nuts (1). Tighten the nuts to 20±1 inch pounds.

xii) Reassemble Connecting Rods

Refer to Figure 4-2.51. Connecting Rod Assemblies. Reassemble the connecting rods as described below.

1. If the jam nut was removed, turn the jam nut (13) up the rod end bearing (12) to approximately 1.25 inches from the spherical bearing centerline.
2. Hold the rod end bearing (12) in a vise with padded jaws and turn the connecting rod (11) onto the rod end bearing.
3. Measure from the end of the connecting rod to the spherical bearing centerline and position the connecting rod end 1.38 inches from the spherical bearing centerline. Turn the jam nut against the connecting rod

tight enough to keep the rod end and connecting rod from moving from the established position during the rest of the assembly procedure.

4. If the jam nut was removed, turn the jam nut (10) up the rod end bearing (9) to approximately 1.25 inches from the spherical bearing centerline.

5. Hold the rod end bearing (9) in a vise with padded jaws and turn the connecting rod (11) onto the rod end bearing.

6. Measure from the centerline of each spherical bearing, and turn the connecting rod and assembled rod end bearing (12) onto the rod end (9) until the distance between the centerlines is 29.50 inches. Turn the jam nut (10) against the connecting rod tight enough to keep the assembly from moving from this position during the rest of the assembly procedure.

NOTE: The length of the straight connecting rod will be adjusted as necessary when the connecting rods are installed on the doors and door operator.

7. If the jam nut was removed, turn the jam nut (2) up the rod end bearing (3) to approximately 1.00 inch from the spherical bearing centerline.

8. Hold the rod end bearing (3) in a vise with padded jaws and turn the angled connecting rod (5) onto the rod end bearing.

9. Measure from the end of the angled connecting rod to the rod end bearing centerline and position the connecting rod end 1.16 ± 0.06 inches from the spherical bearing centerline.

10. Tighten the jam nut against the connecting rod to 60 ± 3 foot pounds.

11. Using a drill press and a 3/32-inch drill bit, and using the pilot hole in the angled connecting rod as a guide, drill a 0.094 - 0.097-inch hole through the threaded end of the rod end bearing.

12. Press in the rollpin (1) so it is flush with to below the surface of the connecting rod on both sides of the hole.

13. If the jam nut (4) was removed, turn it up the adjustment coupling (8) to approximately 2.25 inches from the end of the coupling.

14. If the jam nut (7) was removed, turn it up the rod end bearing (6) to approximately 1.25 inches from the spherical bearing centerline.

15. Hold the rod end bearing (6) in a vise with padded jaws and turn the adjustment coupling (8) onto the rod end bearing.

16. Measure from the centerline of each spherical bearing, and turn the adjustment coupling (8) onto the rod end (6) until the distance from the spherical bearing centerline to the mating end of the adjustment coupling is 1.38 ± 0.03 inches.

17. Tighten the jam nut (7) against the adjustment coupling to 60 ± 3 foot pounds.

18. Hold the rod end bearing (6) in a vise with padded jaws and turn the angled connecting rod and assembled components onto the adjustment coupling (8) until the distance between the face of the angled connecting rod and the far end of the adjustment coupling (8) is 2.50 ± 0.03 inches.
19. Tighten the jam nut (4) against the angled connecting rod to 60 ± 3 foot pounds.
20. Verify that a 0.040 inch inspection wire cannot pass through the inspection holes in the connecting rods.

NOTE: The length of the angled connecting rod is adjusted as necessary when the connecting rods are installed on the doors and door operator.

4-2.1.6.i Adjustment/Test

a) Adjustment

i) Door Linkage Adjustment

1. After completing the door panel alignment, attach the RH and LH connecting rods to the respective door operator teeter lever pins. Apply cotter pins through the hole of each pin and then torque (22 ft-lbs) the lock nuts.
2. Place the teeter lever in the locked, over center position. The teeter lever must contact the plastic bumper on the base plate assembly.
3. Loosen the jam nuts securing the rod end bearings to the connecting rod. Rotate the connecting rod so that the panel begins to close against the module frame.
4. Adjust the connecting rod length so that the doors compress the face seal. Check that the door bottom seals are contacting the edge of the threshold. Do not over compress the seals.

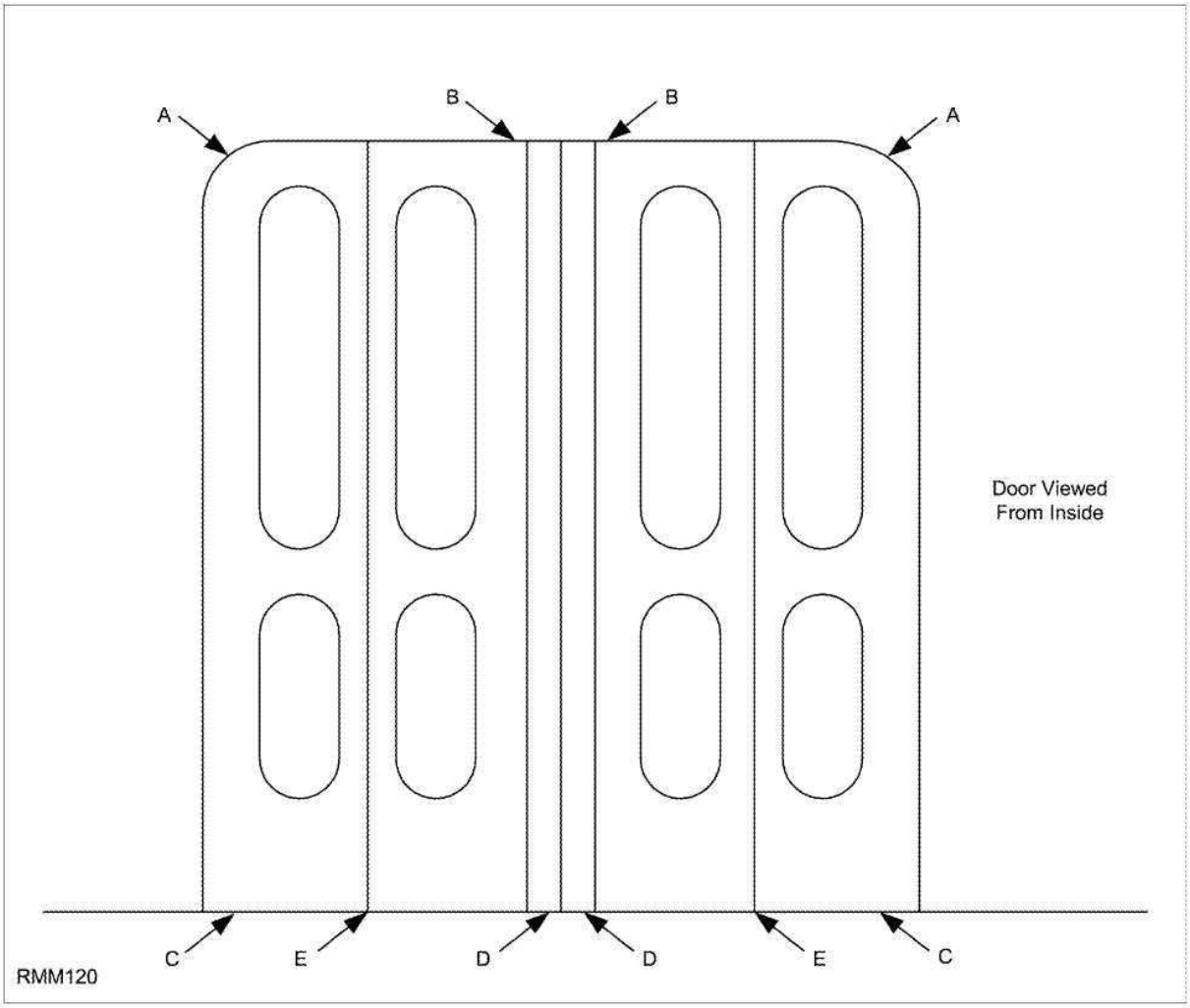

Figure 4-2.53. Door and Face Seals

5. Verify the contact between the door and face seal and between the bottom door seals and the edge of the threshold by inserting a 0.015-inch thick special gauge (plastic or metallic tool) along these areas (refer to location E in Figure 4-2.53).

6. Repeat the above steps for the opposite door.

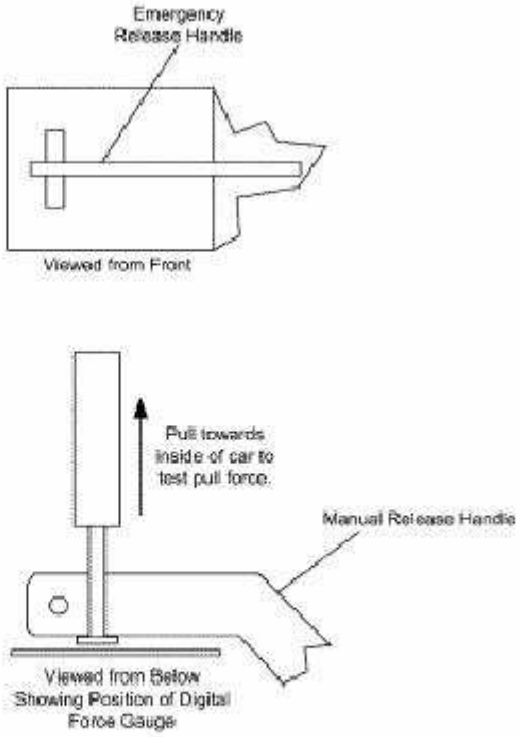

Figure 4-2.54. Manual Release

Using a force gauge, measure the force required to actuate the manual release lever on the door operator assembly. This force should not exceed 50 pounds (to Figure 4-2.54). If the force exceeds 50 pounds, then readjust the connecting rods to reduce the amount of pre-load between the doors and the face seal and check the force again. Recheck the doors / face seal interface as described in step 5.

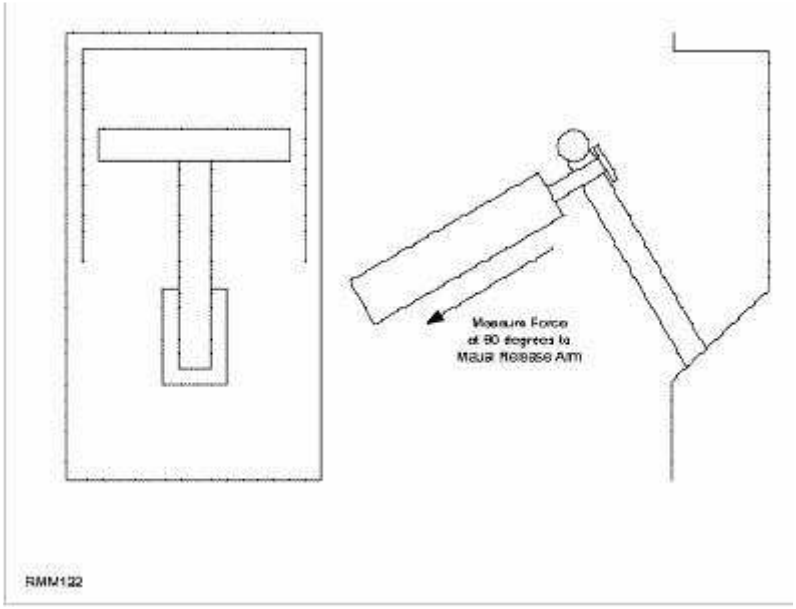

Figure 4-2.55. Lower Manual Release

Using a force gauge, measure the force required activating the lower manual release lever (at the center door locations only). Pull the lever with the gauge while maintaining a 90° angle between the gauge and the manual releas e lever. The force measured once the doors open should not exceed 60 pounds (refer to Figure 4-2.55). If the force exceeds 60 pounds readjust the connecting rod lengths as described in step 7 and/or check the routing of the manual release cable for snags or kinks. Also verify that the manual release lever rotates freely without any interference with the adjacent structure.

Using a clamp, measure the force needed to pull and push the panel leading edge with a Force Gauge. The force necessary to move the connected panels must be less than 20 lbs.

Tighten all connecting rod jam nuts after verifying adjustment. Before tightening check for proper spherical bearing alignment (The spherical bearings must be along the same line).

Manually open the door panels. Verify that the door bumper stops touch in the full open position. With the bumper stops touching, verify that the DOOS pin on the door operator teeter lever is not touching the plastic stop on the motor and gear housing assembly. If the DOOS pin touches the plastic stop readjust the position of the driven panels until the DOOS pin looses the contact with the plastic stop. After this readjustment is completed, verify that there is a minimum of 50” for the central door opening or 42" for the end door opening.

Verify clear door opening as described in section 4-2.1.1.i a) (ii).

ii) Door Panel Sensor Adjustment

Place the doors in the fully closed and locked position.

Place a 0.060" to 0.100" shim on the top surface of the roller bracket assembly directly beneath the sensing face of the panel sensor.

Loosen the panel sensor bracket mounting hardware and lower the sensor assembly until the sensor face makes contact with the shim.

Torque the sensor bracket mounting hardware to 19" inch-pounds and secure adjustment.

Remove the shim and verify the gap using a feeler gauge. As an example using a 0.09 inch shim, a 0.08-inch feeler gauge should be GO and a 0.1-inch feeler gauge NO GO

b) Test

4-2.1.7 Door Sensitive Edge Assembly

4-2.1.7.a Description & Operation

The door sensitive edge assemblies (Refer to Figure 4-2.56) provide 2 functions. First, if they contact an obstruction in the doorway, they prevent the door from completing its closing movement and cause the door to open to free the obstruction. Second, they provide weather tight sealing at the door mating faces.

The sensitive edges are sealed air chambers with a pneumatic sensing tube from the air chamber to a sensitive pressure switch. When the sensitive edge contacts a doorway obstruction the edge compresses and decreases the air chamber volume. This sends a pressure pulse to the pressure switch, which sends an OBSTRUCTED DOOR signal the DCM. The DCM stops the closing cycle and opens the door so the obstruction can be cleared. After a preset time, the door closing sequence is commanded again. If the door is unobstructed, it closes. The sensitive edge function is disabled by the door operator controller and it ignores the pressure pulse caused when the sensitive edge door seals contact and seal the door opening.

The interlocking edges are designed to minimize rubbing during closing and form a tight seal as the doors close. As the doors pivot and open, the interlocking edges pivot away from each other, and disengage without rubbing and pulling.

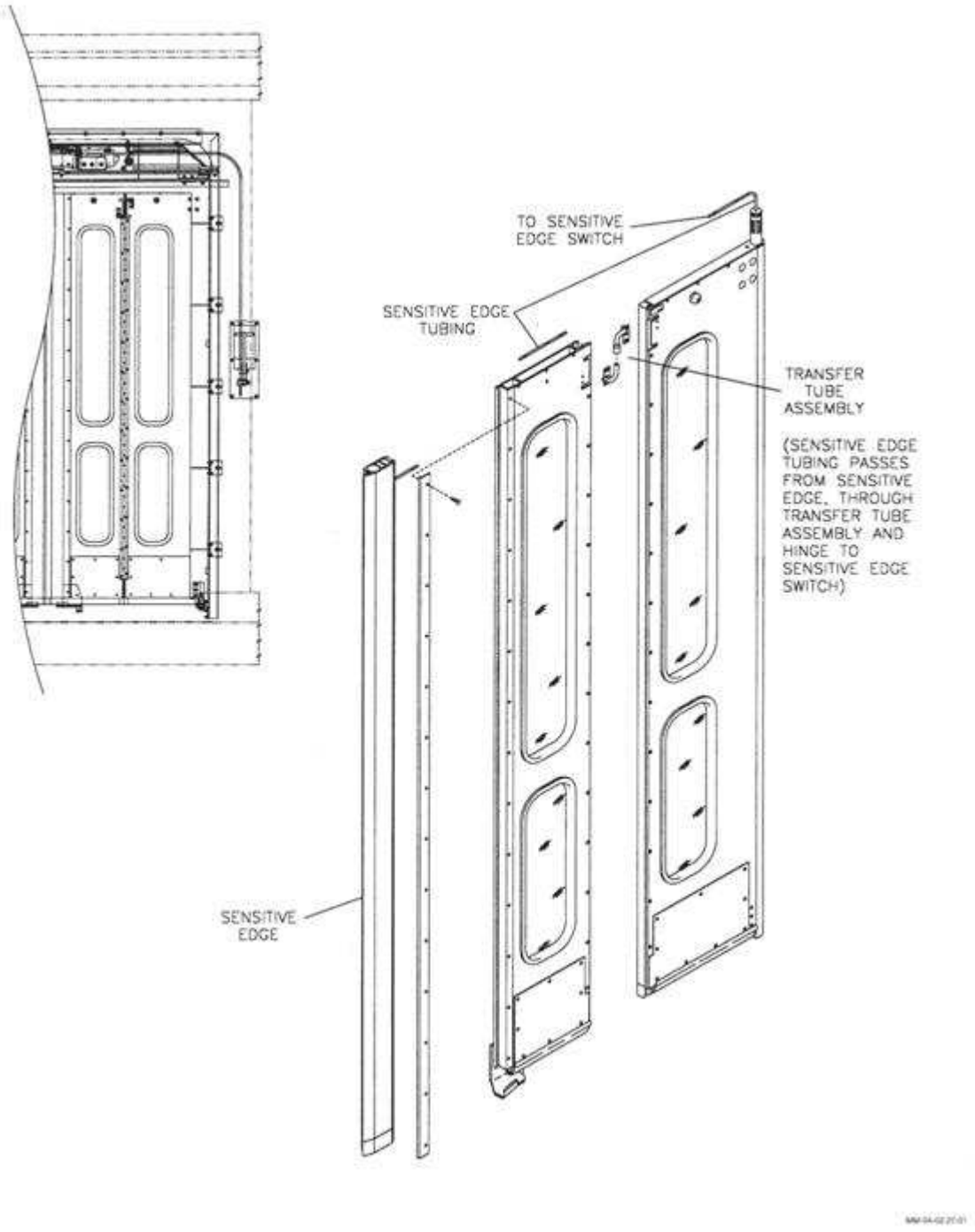
TO SENSITIVE EDGE SWITCH
SENSITIVE EDGE TUBING
TRANSFER TUBE ASSEMBLY
(SENSITIVE EDGE TUBING PASSES FROM SENSITIVE EDGE, THROUGH TRANSFER TUBE ASSEMBLY AND HINGE TO SENSITIVE EDGE SWITCH)
SENSITIVE EDGE

Figure 4-2.56 Door Sensitive Edge Assembly

4-2.1.7.b Specific Safety Precautions

For Specific Safety Precautions refer 4-2.b

4-2.1.7.c Fault/Isolation

Refer section 4-2.c for fault/isolation of Door Sensitive Edge Assembly

4-2.1.7.d Disassembly (Not Applicable)

4-2.1.7.e Cleaning/Painting (Not Applicable)

4-2.1.7.f Inspection (Not Applicable)

4-2.1.7.g Repair (Not Applicable)

4-2.1.7.h Reassembly

- **Reference Information.**
  1. Tools / Equipment.
     – MBTA Overhaul Standard Tools Kit.
  2. Material (Not Applicable).
- **Procedure**

a) Reassembly (Not Applicable)

b) Installation of sensitive edge assembly

(Refer to Figure 4-2.15 Door Center Panel Sensitive Edge Assembly (Step 3)) Install the sensitive edge assembly as described below.

1. Install a six-foot length of tubing (4) through the port in the door skin for the transfer tube assembly. Leave approximately two inches of tube protruding through the transfer tube port. Tape the end to the door so it cannot be pulled into the door.
2. Feed the free end of the tube through the hole in the edge of the door for the tube from the sensitive edge assembly.
3. Install a connector (5) over one end of the tubing (4).
4. Install the connector over the tube on the sensitive edge (3).
5. If necessary, coat the sensitive edge with Slip-Eaze or a half-and-half solution of dish soap and water, which will provide lubrication while the sensitive edge is being slid into the slot.
6. Position the sensitive edge so its protruding tube will enter the hole in the door edge.

7. Push the sensitive edge into the slot. The sensitive edge is correctly positioned when it is flush with to slightly inside the top and bottom surfaces of the door panel, and the protruding tube sticks straight into the door.
8. Make sure the screw holes are properly aligned, and install the edge retainer (2) with 10 flat head screws (1). Tighten the screws to 13 ± 1 inch pounds.
9. Pull the taped end of the tube through the transfer tube hole until there is approximately two inches of extra tubing in the door interior.

4-2.1.7.i Adjustment /Test (Not Applicable)

4-2.1.8 Door Sealing System

4-2.1.8.a Description & Operation

The door and doorway are sealed with neoprene door panel face seals. These seals mount to the door module frame assembly along the outboard surfaces of the header and side extrusions adjacent to the inside surface of the closed door panels. Removable retaining strips secure the face seals to the door module frame.

The door-to-doorway face seals have a bulb profile that is compressed by the inside perimeter surfaces of the door panel when they close. This forms a weather tight seal along the top and sides of the door opening. The bottom of the opening is sealed by a bulb seal mounted directly to the bottom edge of the door panels. This seal compresses against the outer edge of the threshold when the panels close.

The door panel bifold hinge seals use a pair of bulb profile seals, one on each door panel at the hinge, to provide a weather tight seal when the doors are closed and locked. These seals contact each other and compress to form a tight and continuous seal.

The brush seal is mounted across the top of the door opening adjacent to the guide track. It prevents water and debris from accumulating along the top edges of the door panels. This seal can be adjusted vertically.

4-2.1.8.b Specific Safety Precautions

For Specific Safety Precautions refer 4-2.b

4-2.1.8.c Fault/Isolation

Refer Section 4-2.c for fault/isolation of Door Sealing System

4-2.1.8.d Disassembly (Not Applicable)

4-2.1.8.e Cleaning/Painting (Not Applicable)

4-2.1.8.f Inspection (Not Applicable)

4-2.1.8.g Repair (Not Applicable)

4-2.1.8.h Reassembly (Not Applicable)

4-2.1.8.i Adjustment /Test (Not Applicable)

4-2.1.9 Door Speed Control

4-2.1.9.a Description & Operation

The door speed is controlled through variable pulse-width modulation driving the H-bridge motor drive circuit in the controller. The controller software includes an optimum position versus time data table. The actual operation is compared to this table, which varies the motor pulse width as required to keep operation at or near the table values. As the doors approach the fully opened position, the motor is slowed and stopped by dynamic braking through the H-bridge.

4-2.1.9.b Specific Safety Precautions

For Specific Safety Precautions refer 4-2.b

4-2.1.9.c Fault/Isolation

Refer Section 4-2.c for fault/isolation of Door Speed control

4-2.1.9.d Disassembly (Not Applicable)

4-2.1.9.e Cleaning/Painting (Not Applicable)

4-2.1.9.f Inspection (Not Applicable)

4-2.1.9.g Repair (Not Applicable)

4-2.1.9.h Reassembly (Not Applicable)

4-2.1.9.i Adjustment /Test (Not Applicable)

4-2.2 Bridgeplate Equipment

4-2.2.a Description & Operation

BRIDGEPLATE COMPONENTS DESCRIPTION

The bridgeplate assembly (Refer to Figure 4-2.57) is an extend-retract ramp that provides the bridge between the car and the passenger platform. It is designed to extend approximately 24 in (609.6 mm) to a passenger platform 7 to 8 in (177.8 to 203.2 mm) above track rail height. When the bridgeplate retracts, it stows beneath the car floor behind the bridgeplate door assembly.

The bridgeplate, which is used by riders using wheelchairs and walkers, does not deploy automatically. It is requested via the bridgeplate request pushbuttons located inside and outside the car, or is deployed by the operator.

There are 4 bridgeplate assemblies in each vehicle, one located and operating in conjunction with each of the side doors (A2, A3, B2 and B3) (Refer to Figure 4-2.1). The RH and LH bridgeplates are physically and mechanically identical. The bridgeplate wiring harnesses are configured specifically for either RH or LH operation, and are routed into the bridgeplate assembly from either RH or LH sides. The bridgeplate assemblies mount directly beneath the floor structure at the door openings. They are installed from the side of the car by sliding them into parallel support channels that are integral with the floor structure. The bridgeplate assembly is shimmed to meet installation and alignment requirements, and bolted to the vehicle frame. The bridgeplate electrical connection is a watertight, 1/4-turn bayonet connector mounted in either LH or RH side tube on the bridgeplate.

The connector is accessible from beneath the car.

The bridgeplate main components are listed below:

a) Bridgeplate ramp, support plate, carriage plates, and linkages.

b) Support and guide components, including the rollers, the guide channels for the rollers, the guide block and integral roller, and the front center roller.

c) Drive system, including a single DC motor with encoder, cogged drive pulleys and mating cogged drive belts, 2 lead screws and drive nuts, bearings, and bellows that cover and protect the screws when the car is in motion.

d) Lock system, which is a spring loaded engaged and solenoid disengaged system that locks the bridgeplate in the extended and retracted positions.

e) Manual unlock mechanism that allows the bridgeplate to be stowed manually when the power is off.

f) Box tube framework, consisting of the rear tube, 2 side tubes, and the front bar.

g) Top and bottom covers.

h) Front cover assembly (hinged).

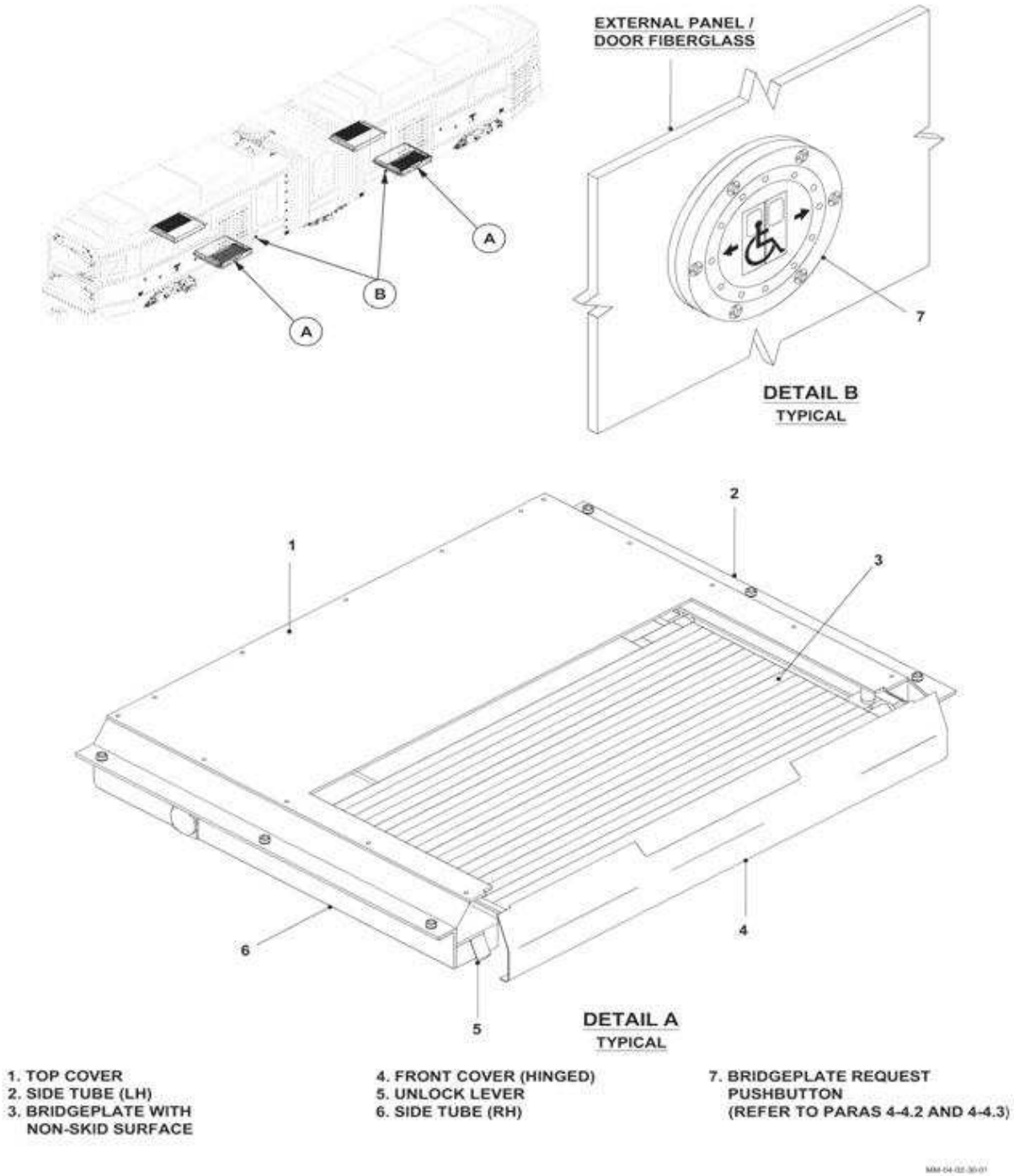

Figure 4-2.57 Bridgeplate Equipment - Location

a) Bridgeplate Ramp, Support Plate, Carriage Plates and Linkages

The bridgeplate ramp (Refer to Figure 4-2.58) is an anodized aluminum structure that includes the replaceable UHMW plastic bridgeplate nose, the replaceable traction surface, and the stainless steel roller guide on each side of the plate The bridgeplate ramp rides on the support plate, which is bolted to the carriage plates. The carriage plates provide the interface with the drive screws, and mounting for the linkages, and the support and guide components.

The carriage plates are coupled with 2 drive screws driven by a single motor. The drive screws extend and retract the bridgeplate through 2 hinged linkages. The support and guide components are mounted to the stainless steel carriage side plates, which are mounted to the carriage plates.

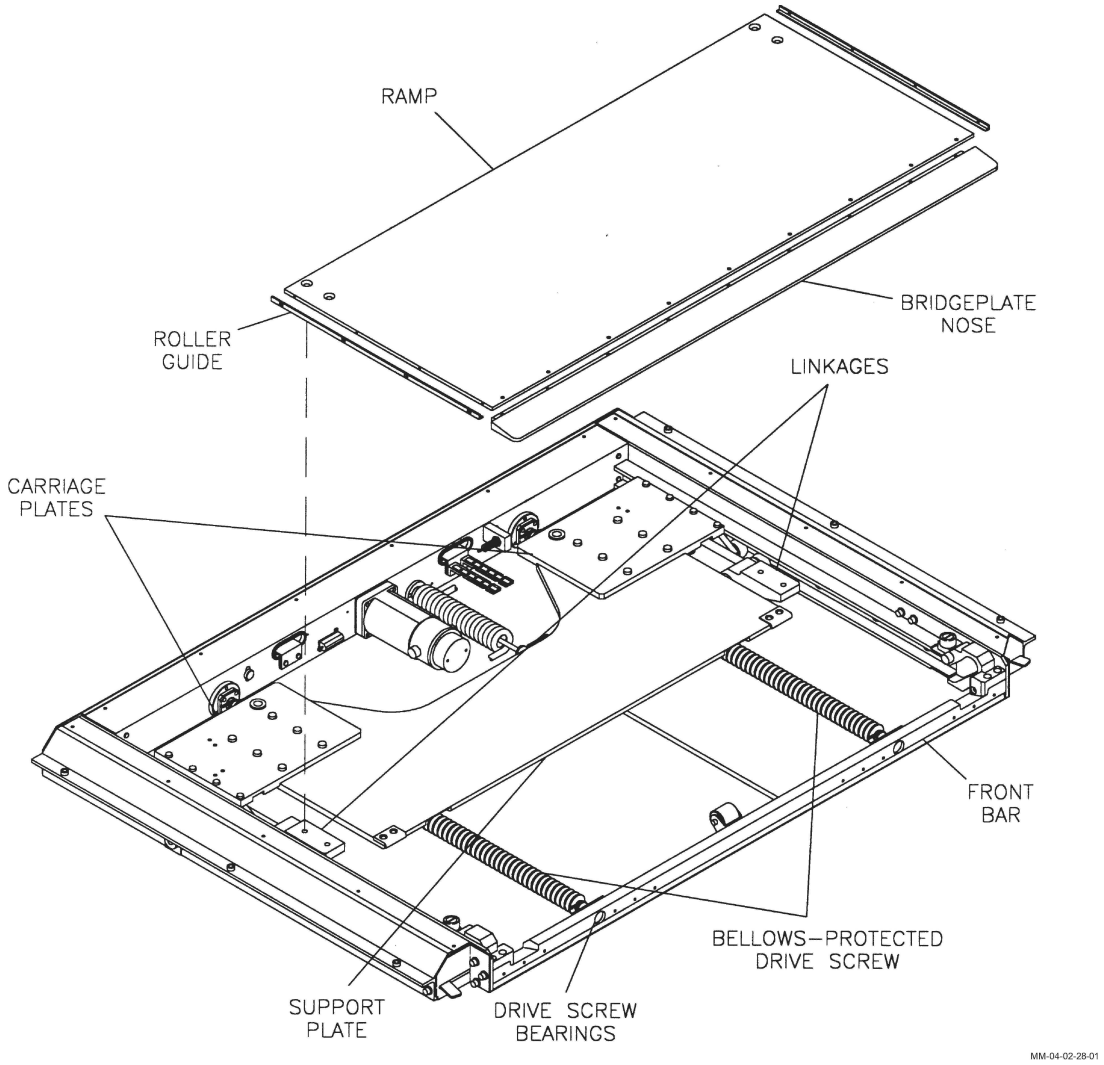

Figure 4-2.58 Bridgeplate Ramp, Support Plate, Carriage Plates and Linkages

b) Bridgeplate Support and Guide Components

The support and guide components (Refer to Figure 4-2.59) are mounted to the carriage side plates ad the side tubes. Each carriage side plate provides mounting for 3 roller assemblies, a lock assembly, ad a linkage assembly. The rollers ride in bronze guide channels, one on each of the side tubes. These low friction rollers move horizontally, and support the vertical loading. A guide block with a roller assembly is located in the center of the front bar. The rollers in the guide blocks are mounted with their axes vertical, and are outboard lateral guides for the bridgeplate.

The low friction roller assembly in the front bar guides and supports the center vertical bridgeplate load during deployment and retraction. During use, the weight that is placed on the bridgeplate a the passengers enter and leave the rail cars is carried by the side rollers and guide channels, and the bridgeplate nose, which rests on the passenger platform support.

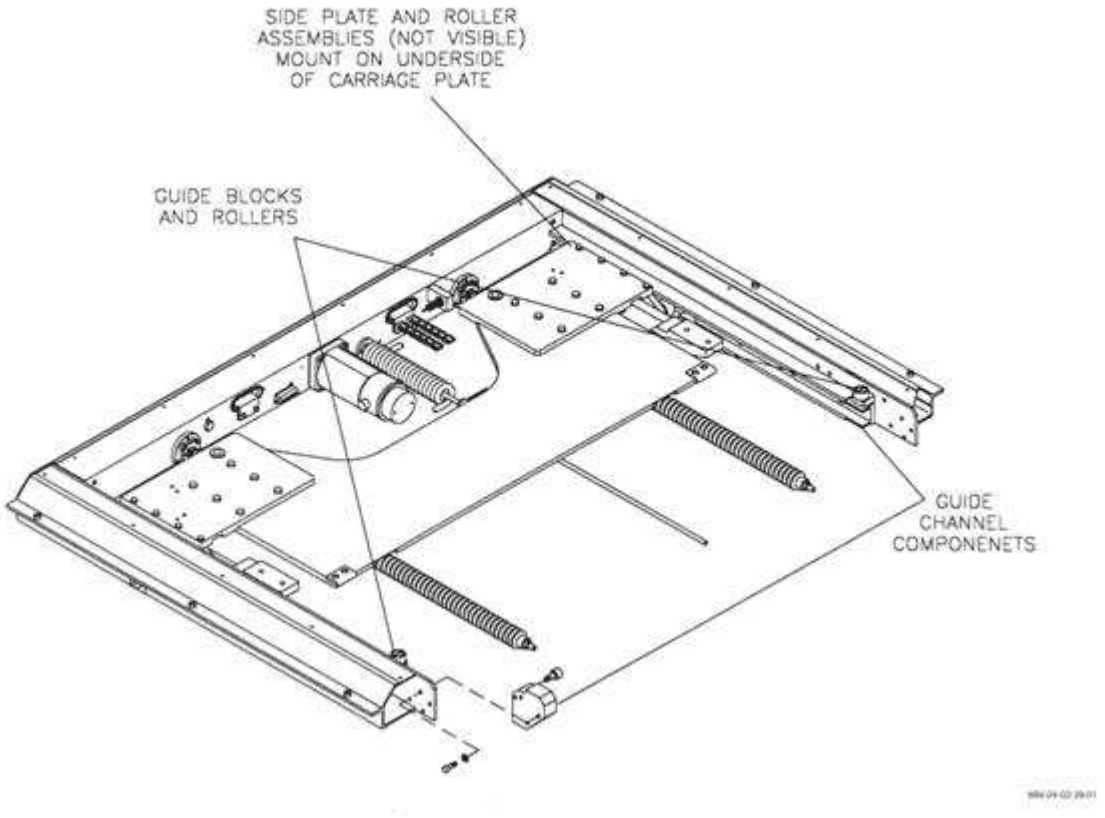
SIDE PLATE AND ROLLER ASSEMBLIES (NOT VISIBLE) MOUNT ON UNDERSIDE OF CARRIAGE PLATE
GUIDE BLOCKS AND ROLLERS
GUIDE CHANNEL COMPONENETS

Figure 4-2.59 Bridgeplate Support and Guide Components

c) Bridgeplate Drive System

The drive system (Refer to Figure 4-2.60) consists of a high torque DC motor with encoder that is mounted to the rear tube. The motor output shaft carries a cogged driving pulley configured for 2 cogged belts. The drive belts each made with a cogged driven pulley on the inboard end of its lead screw. The belts are kept tight by tensioning pulleys loaded against the back (smooth) side of each belt.

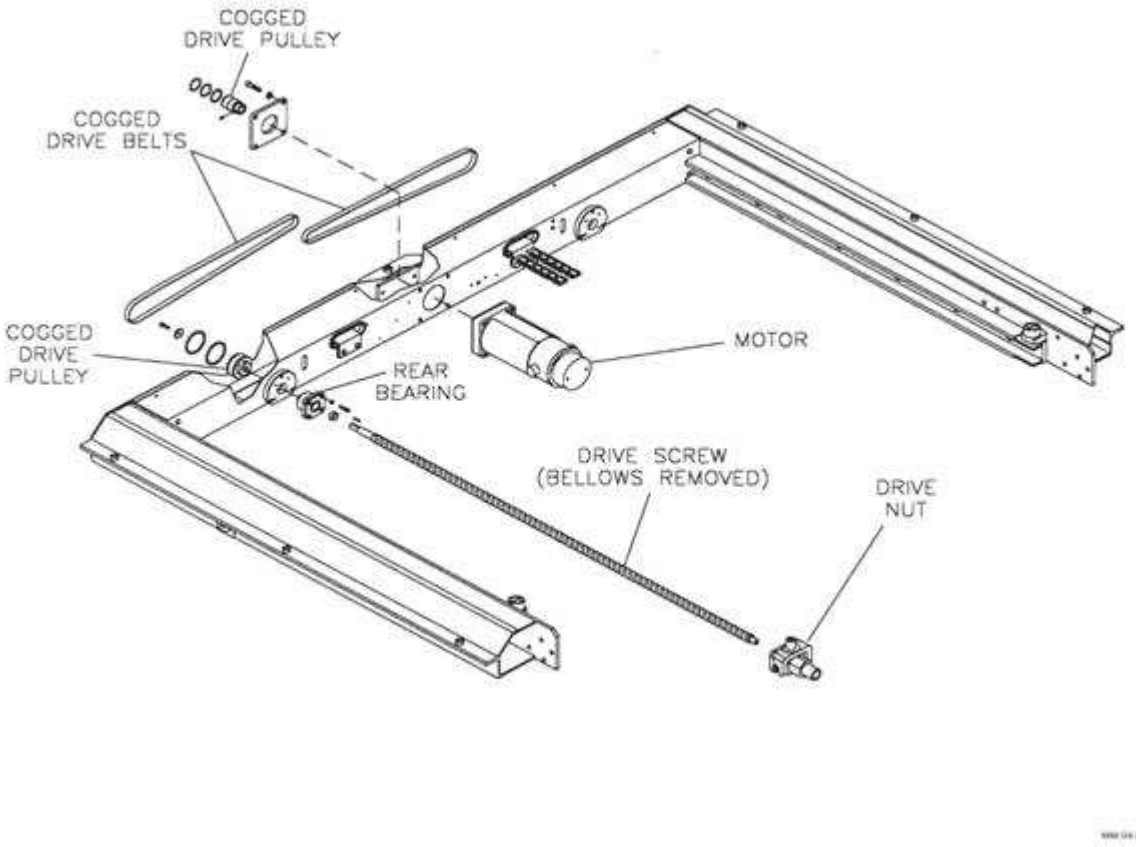

Figure 4-2.60 Bridgeplate Drive System

Each driven pulley drives its own lead screw (Refer to Figure 4-2.61). The lead screws, which have a rolled, 1/2 in (12.7 mm) lead, mate with a ball nut assembly that pilots in a press fit bushing in the carriage plate.

The drive nuts locked in a yoke coupled with a yoke retainer. The yoke retainer pilots in the carriage bushing, compensating for small lateral movements of the bridgeplate during extension and retraction. The yoke pilots in the yoke retainer, compensating for small vertical bridgeplate movements.

Each end of the drive screw is mounted in low friction bearings, providing a mechanically efficient drive train. The lead screws are protected by bellows that extend and shield the screws from contamination when the bridgeplate extends, exposing the screws. Because the train is stationary at all times when the bridgeplate is extended, the exposure to laterally driven contamination minimal.

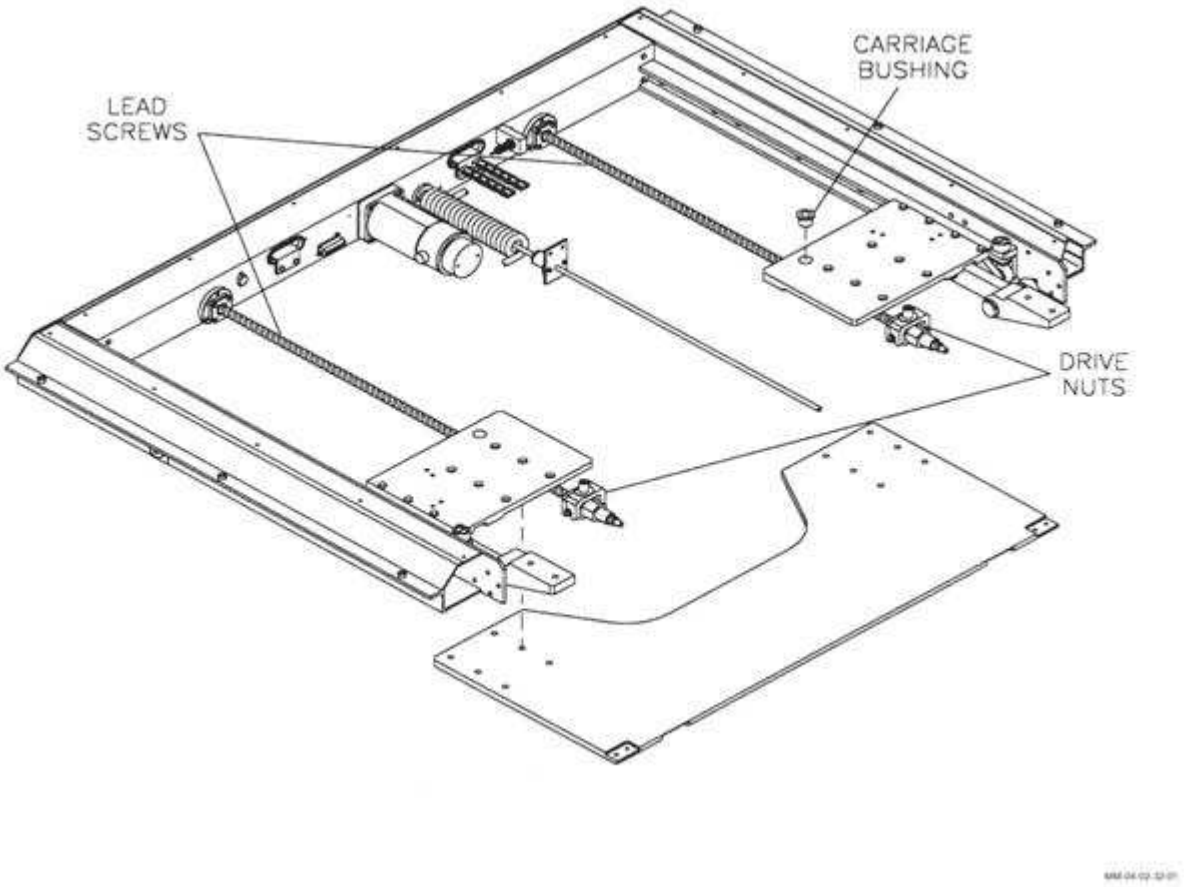

Figure 4-2.61 Bridgeplate Lead Screw and Drive Nut Assembly

d) Bridgeplate Lock System

The lock system (Refer to Figure 4-2.62) consists of 2 spring loaded locking plates, one on each side of the bridgeplate, and 2 retract solenoids. The locking plates are mounted on the carriage side plates and carried in the guide channels. The guide channels have 2 engagement slots, one at each end of the bridgeplate travel.

When the bridgeplate is retracted, the locking plates are spring loaded against a locking pin assembly that engages the inboard locking slots. In the extended position, the locking plates and locking pins are spring loaded to engage the outboard locking slots. This prevents the bridgeplate from moving when the motor is not powered.

The motor drive command sequence begins with commands to both retract solenoids, which withdraw the locking pins from the slots. As each locking plate pivots, it breaks contact with its LOCKED switch, which enables the bridgeplate motor to extend or retract the bridgeplate. When the bridgeplate reaches its travel limit, which is determined by the encoder as it counts motor pulses, the controller removes the drive command from the motor and current from the retract solenoids. The spring loaded locking plates drive the locking plates drive the locking pins into the corresponding locking slots. This locks the bridgeplate in position until the Door Control Module again supplies the move command sequence.

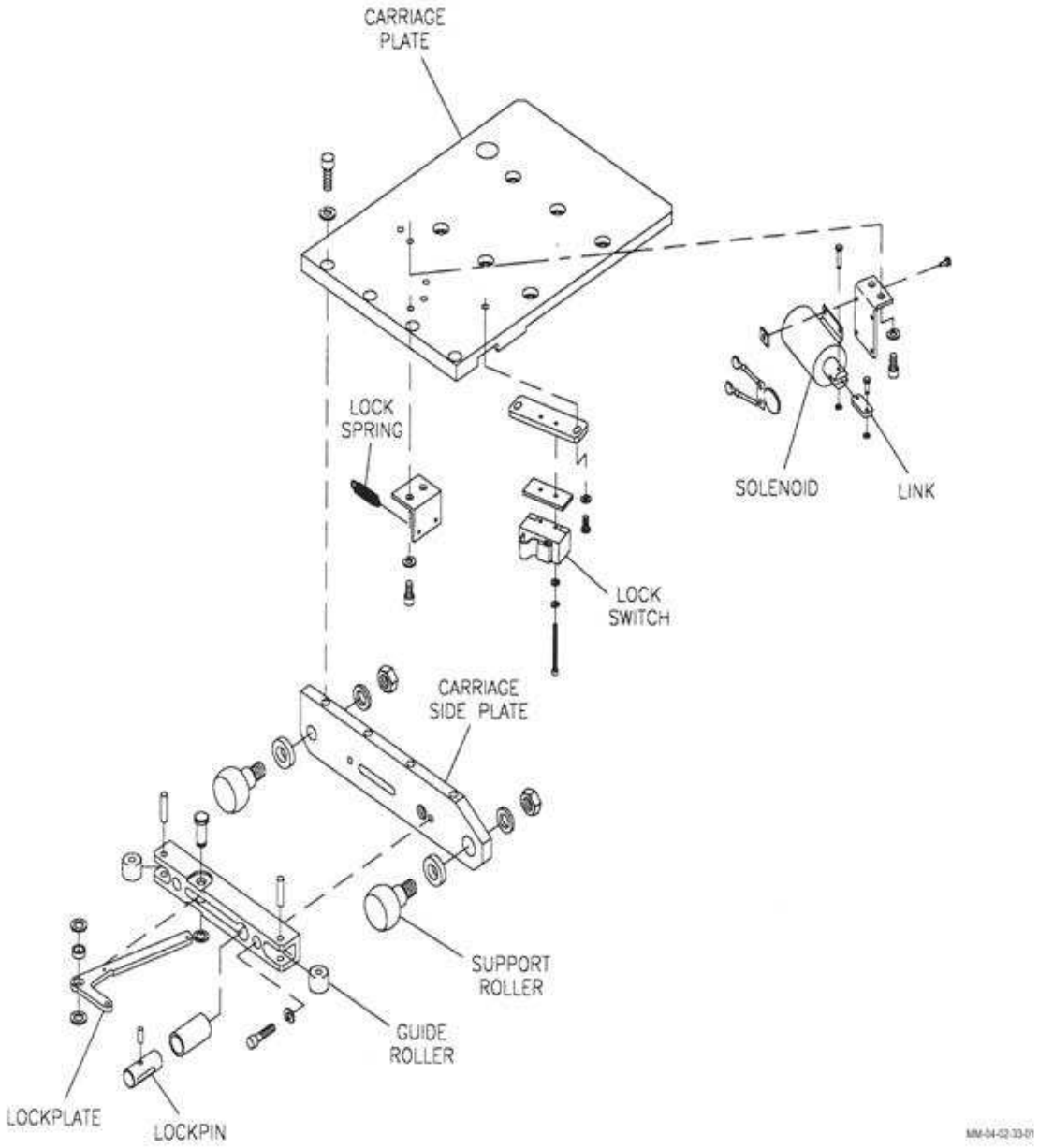

Figure 4-2.62 Bridgeplate Lock System

e) Bridgeplate Manual Unlock System

The bridgeplate assembly (Refer to Figure 4-2.63) has a pair of manual unlock levers that are accessible from outside the car. These levers are spring loaded away from the locking slots in the guide channels. If there is a power or system failure with the bridgeplate extended, these levers are used to disengage the locking pins, allowing the bridgeplate to be stowed manually.

The bridgeplate by-pass switch must first be placed in the BYPASS position, and the bridgeplate motor switch must be set to OFF before the bridgeplate is disengaged and pushed back.

Moving the levers toward the bridgeplate pushes the noses on the unlock levers into the outboard locking slots, forcing the locking pins out of the outboard locking slots. The noses on the manual unlock levers are only half the length of the locking slots. Once the locking pins have been forced from the outboard locking slots, the bridgeplate can be pushed inboard slightly, until the pins clear the locking slots and ride on the guide channels. Releasing the manual unlock levers withdraws the locking lever noses from the locking slots, and the bridgeplate can be pushed into the retracted position. When the bridgeplate reaches the retracted position, the spring loaded locking levers push the locking pins into engagement in the inboard locking slots, positively locking the bridgeplate for transit.

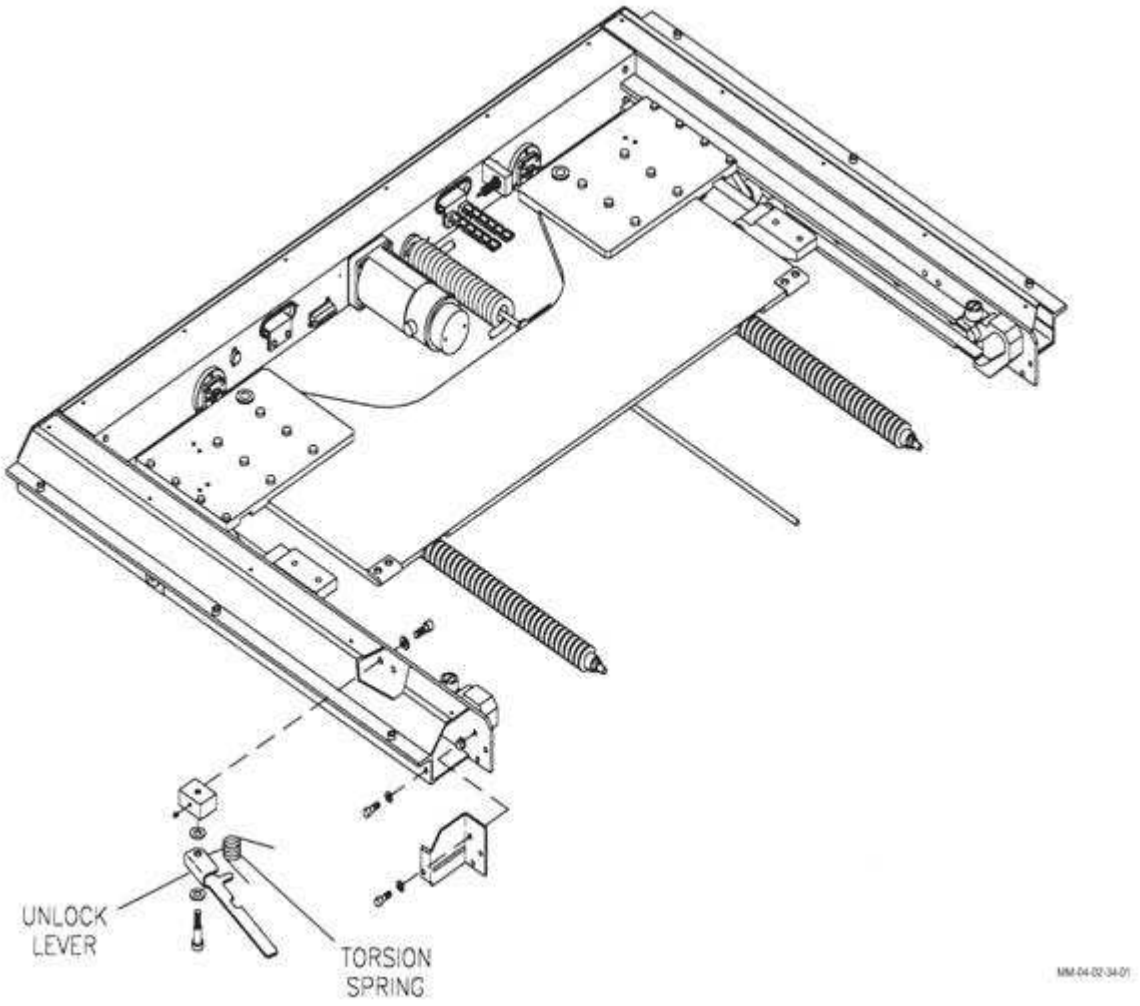

Figure 4-2.63 Bridgeplate Manual Unlock System

f) Bridgeplate Framework

The bridgeplate framework (Refer to Figure 4-2.64) consists of 2 extruded side tubes, an aluminum rear tube, and an aluminum front bar together to form a rigid framework. These components are hard anodized for wear and corrosion protection. The rear tube provides the mounting for the high torque DC drive motor, and for the rear bearings for the drive screws.

The front bar provides the mounting for the front bearings for the drive screws, and also mounts a roller assembly that supplies a low friction rolling surface for the bridgeplate as it is extended and retracted. The side tubes provide structural rigidity as well as mounting the support and guide components and the manual unlocking system.

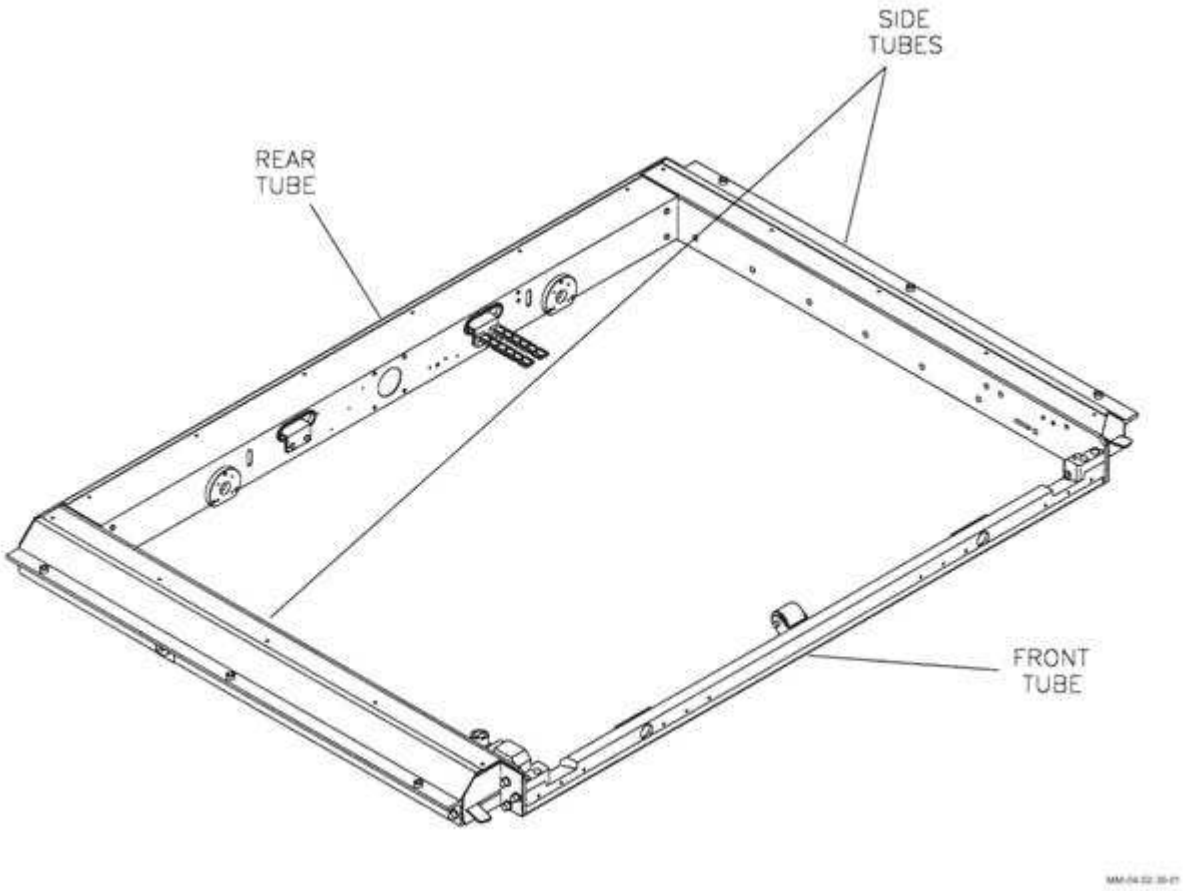

Figure 4-2.64 Bridgeplate Framework

g) Top Cover and Bottom Covers

The bridgeplate has a one piece top cover that is mounts on the top of the bridgeplate. The top cover is retained with plastic push clips that provide easy access to the bridgeplate assembly interior.

The bottom cover is a hinged cover that allows access to the underside of the bridgeplate for maintenance. The cover is secured to the underside of the bridgeplate with captive screws.

Both covers seat against neoprene gasket material to provide additional environmental protection. The bottom cover is channeled and has self-clearing drain holes to drain any water that may have entered the bridgeplate assembly interior.

h) Bridgeplate Front Cover Assembly

The front cover assembly (Refer to Figure 4-2.65) consists of a hinged, stainless steel cover with 2 cover rollers mounted to the cover plate interior. The cover hinges mount on the bridgeplate front bar so that the cover swings out and downward when the bridgeplate ramp deploys. The cover rollers ride on the underside of the bridgeplate ramp, which provides a low friction interface with the moving bridgeplate ramp. The hinges are spring loaded, and close the cover when the bridgeplate ramp retracts.

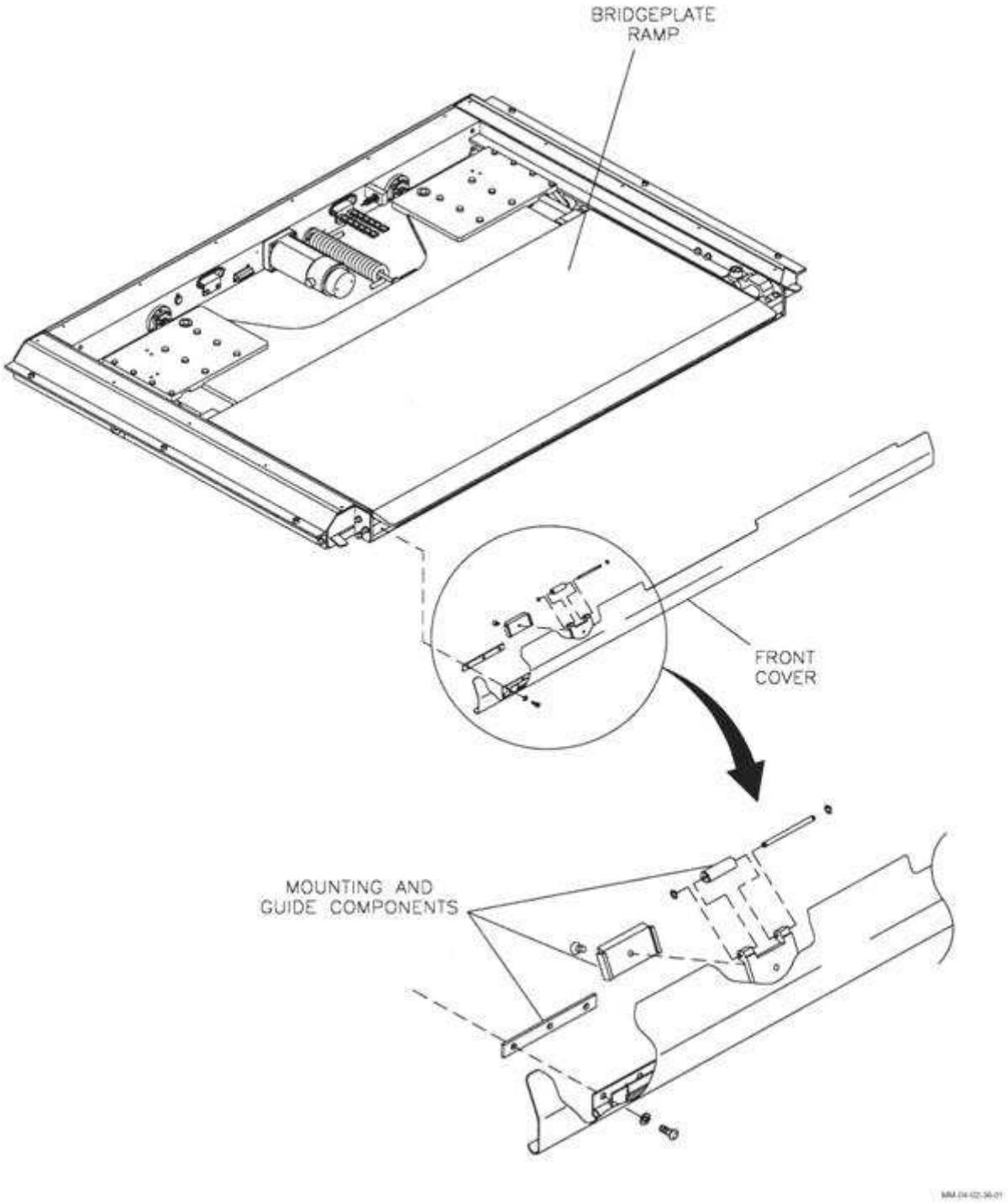

Figure 4-2.65 Bridgeplate Front Cover Assembly

BRIDGEPLATE OPERATION

a) Deploying the Bridgeplate

When the controller receives a bridgeplate deploy request it verifies that the train is stopped and the car doors open before deploying the bridgeplate. The bridgeplate deploy sequence is as follows:

1. The Door Control Module provides the pull solenoids with 35 VDC at inrush current to pivot the locking levers and withdraw the locking pins from the inboard locking slots. This current is provided until the locking plates pivot off the LOCKED switches.
2. The controller drops the solenoid current to 0.5 ampere, which holds the solenoids in the pulled position. The solenoid is held in the pulled position while the bridgeplate is being deployed. At the same time, the controller supplies power to the bridgeplate motor, which drives bridgeplate to the deployed position.
3. The motor encoder and controller count motor pulses to monitor the bridgeplate position. As the bridgeplate reaches the fully deployed position, the controller removes power from the motor and locking lever solenoids. Bridgeplate movement stops, and the locking levers pivot and push the locking pins into the locking slots. The locking levers also contact the LOCKED switches.

   If either or both of the LOCKED switches are not made when the controller removes power from the solenoids, the controller reapplies power to the bridgeplate motor until the lock pins engage. This helps seat the locking pins if the pins and locking slots are slightly misaligned.
4. During bridgeplate deployment, the controller monitors the current required to drive the bridgeplate. During the first 3 in. of bridgeplate travel, the controller determines the current required to move the bridgeplate. The controller then limits the current provided to the motor to the average drive current plus the current required to drive an additional fifteen pounds. If the drive current exceeds the limit, the controller shuts off the bridgeplate motor.
5. For 2 seconds prior to deployment, and while the bridgeplate ramp is moving, the controller enables the bridgeplate alarm horn and lamp. The alarm horn sounds and the lamp flashes until deployment is complete.

   The bridgeplate deploys approximately 24 in. at 2 in. to 3 in. per second. For all but the last three inches of deployment of the bridgeplate movement is essentially horizontal. For the last 3 in. of travel, the outboard rollers follow the channels in the front guide block at a 42° angle upward. This raises the back of the bridgeplate of the level of the car floor and allows the front of the bridgeplate to tip downward a maximum of 12°to meet the platform.

b) Retracting the Bridgeplate

When the controller receives a bridgeplate retract command, it verifies that the train is stopped and the car door is open before retracting the bridgeplate. The bridgeplate retract sequence is as follows:

1. The Door Control Module provides the pull solenoids with 35 VDC at inrush current to pivot the locking levers and withdraw the locking pins from the outboard locking slots. This current is provided until the locking levers pivot off the LOCKED switches.
2. The controller drops the solenoid current to 0.5 ampere, which holds the solenoids in the pulled position. The solenoid is held in the pulled position while the bridgeplate is being retracted. At the same time, the controller supplies power to the bridgeplate motor, which drives bridgeplate to the retracted position.
3. During bridgeplate retraction, the controller monitors the current required to retract the bridgeplate. For a retraction, the current limit is present. If the driver current exceeds the limit, the controller shuts off the bridgeplate motor. This prevents retraction of the bridgeplate if it has a load anywhere on its surface.
4. The motor encoder and controller count motor pulses to monitor the bridgeplate position. As the bridgeplate reaches the fully retracted position, the controller removes power from the motor and locking lever solenoids. Bridgeplate movement stops, and the locking levers pivot and push the locking pins into the locking slots, and also contact the LOCKED switches.

   If either or both of the LOCKED switches are not made when the controller removes power from the solenoids, the controller reapplies power to the bridgeplate motor until the lock pins engage. This helps seat the locking pins if the pins and locking slots are slightly misaligned. The retracted bridgeplate also actuates the BRIDGEPLATE STOWED proximity switch.
5. The controller enables the bridgeplate alarm horn and lap 2 seconds prior to beginning retraction. The alarm horn sounds and the alarm lamp flashes prior to beginning retraction and continues until the controller has received the STOWED and LOCKED signals.

c) Bridgeplate Speed Control

The Bridgeplate speed is controlled through variable pulse-width modulation (PWM) driving the H-bridge motor drive circuit in the controller. The controller software includes an optimum position versus time data table. The actual operation is compared to this table, which varies the motor pulse width as

required to keep operation at or near the table values. The bridgeplate motor is slowed and stopped by dynamic braking through the H-bridge.

d) Operation WARNING and Safety Provisions

The Bridgeplate deployment sequence contains both personnel WARNINGS and safety provisions to prevent injury during bridgeplate operation and use.

The car Door Control Module does not deploy the bridgeplate until the doors are completely open. The control system sounds a warning horn before and during bridgeplate ramp deployment, and before and during retraction.

The bridgeplate drive motor is current monitored, ad stops deployment if the force required for deployment exceeds 15 pounds. If the bridgeplate encounters an obstacle, the controller senses the motor current increase and removes power from the motor. This stops deployment. Similarly, if the controller sense a 50 pound load anywhere on the bridgeplate surface, it inhibits retraction.

4-2.2.b Specific Safety Precautions

WARNING:	**BEFORE PERFORMING BRIDGEPLATE EQUIPMENT MAINTENANCE PROCEDURES DISCONNECT ELECTRICAL POWER FROM VEHICLE BY SWITCHING OFF THE BATTERY CB (3Q03).**

4-2.2.c Fault/Isolation

a) General

The purpose of this Fault Isolation/Repair section is to provide the information needed to trace a failure from its initial symptom to its actual cause in order to return the bridgeplate system to proper function as quickly as possible. Specific Fault Isolation/Repair procedures are provided in the tables in this section.

There are two basic failure modes for the bridgeplate system. These are:

- A bridgeplate, will not operate;
- A bridgeplate operates, but does not operate correctly.

These base faults are fault isolated in Fault Isolation/Repair Table 4-2.34 below. Use this table and the bridgeplate system schematics provided in section 4-3.a of this section to determine the cause of the problem and the corrective actions required for eliminating the problem.

WARNING: **FAULT ISOLATION FOR THE BRIDGEPLATE SYSTEM COMPONENTS WILL REQUIRE TESTS AND CHECKS WITH SYSTEM POWER LIVE. TO AVOID ELECTRICAL SHOCK, FOLLOW GOOD SHOP PRACTICE FOR WORKING WITH POWERED COMPONENTS.**

Bridgeplate does not operate correctly if there is fault in the Door Control Module For the fault isolation/Repair of Door Control Module – refer to section 4-2.c

Bridgeplate Does Not Operate Correctly

Operation of the bridgeplate requires a TRAIN STOPPED signal, a DOOR OPEN condition, and an enable from the train controls. The fault isolation for the bridgeplate is based on these factors.

Table 4-2.34 Bridgeplate Does Not Operate Correctly - Fault Isolation/Repair

Malfunction Symptom	Probable Cause	Corrective Action
The Bridgeplate does not operate when commanded**.**	The solenoids actuate just before the controller provides power to the motors to allow the solenoids to retract the locking pins before the motor begins to drive the ramp. Part of checking for jammed or damaged components is moving the bridgeplate ramp by hand and checking for smooth operation.	
	1. Check for power to the solenoids.	1. Check operating 1. If there is no power to one or both solenoids, correct the condition that prevents power from reaching the solenoid. 2. If there is power to the solenoids and they actuate properly but the bridgeplate ramp does not deploy, see check 3. 3. If there is power to the solenoids but they fail to actuate, see check 2.

Table 4-2.34 Bridgeplate Does Not Operate Correctly - Fault Isolation/Repair (cont'd)

Malfunction Symptom	Probable Cause	Corrective Action
The Bridgeplate does not operate when commanded (cont'd).	2. Check the bridgeplate linkages and locking mechanism for jamming and mechanical damage.	1. If there is jamming or mechanical damage to any of the linkage components or locking mechanism that prevents the solenoid from actuating, replace the bridgeplate. 2. If there is no mechanical cause preventing a solenoid from operating, that solenoid has failed. Replace the solenoid.
	3. After verifying that the solenoids are functional, check for power to the bridgeplate motor.	1. If there is no power to the motor, correct the condition that prevents power from reaching the motor. 2. If there is power to the motor see check 4.
	4. With power to the motor, check the motor current.	1. If the motor is drawing no current, there is an open circuit in the motor. Replace the bridgeplate motor. 2. If the motor is drawing current and the bridgeplate ramp will not deploy, the current will be high, see check 5.

Table 4-2.34 Bridgeplate Does Not Operate Correctly - Fault Isolation/Repair (cont'd)

Malfunction Symptom	Probable Cause	Corrective Action
The Bridgeplate does not operate when commanded (cont'd).	5. Check for damaged or jammed bearings and rollers, broken drive components, and linkage misalignments.	1. If there is jamming or damage, replace the bridgeplate. 2. If there is no jamming or mechanical damage, the motor has failed. Replace the motor
The Bridgeplate operates, but does not operate correctly.	The bridgeplate may operate, but operate slowly, at an uneven speed, or it may not recognize and respond to obstructions during deployment and loads during retraction. Part of checking for jammed or damaged components is moving the bridgeplate ramp by hand and checking for smooth operation. Slow Operation	
	1. Check the motor supply voltage.	1. If the motor voltage is out of voltage range between 24 and 45 VDC, correct the supply voltage. 2. If the voltage is 37.5 VDC, nominal, see check 2.

Table 4-2.34 Bridgeplate Does Not Operate Correctly - Fault Isolation/Repair (cont'd)

Malfunction Symptom	Probable Cause	Corrective Action
The Bridgeplate operates, but does not operate correctly (cont'd).	2. Check the drive belt tension.	1. The force gauge must read 3.25 ± 0.25 lb when the push rod has deflected the belt 0.5 in. 2. If the belt tension is lower than the requirement, adjust the tension. 3. If the belt is properly tensioned see check 3.
	3. Check the bridgeplate bearings and rollers for excessive wear, damage, jamming, or corrosion. Check the ballscrews for excessive wear, corrosion and damage. Make sure the ballscrews are properly lubricated.	1. If the rollers and bearings or ballscrews are not properly lubricated, or if any component is excessively worn, damaged, jammed, or corroded, replace the bridgeplate. 2. If there is no evidence of wear, damage, jamming or corrosion, see check 4.
	4. Check the motor current.	1. If the motor current is high, replace the bridgeplate motor. 2. If the motor current is within limits, one of the drive belts may have broken. The bridgeplate can operate with only one drive belt. Replace the bridgeplate at first opportunity.

Table 4-2.34 Bridgeplate Does Not Operate Correctly - Fault Isolation/Repair (cont'd)

Malfunction Symptom	Probable Cause	Corrective Action
The Bridgeplate operates, but does not operate correctly (cont'd).	Uneven Speed	
	1. Check the bridgeplate bearings and rollers for excessive wear, damage, jamming or corrosion. Check the ballscrew for excessive wear, corrosion, and damage. Make sure the ballscrews are properly lubricated.	1. If the rollers and bearings are excessively worn, damaged, jammed or corroded, replace the bridgeplate. 2. If there is no evidence of wear, damage, jamming or corrosion, see check 2.
	2. Check the motor current.	1. If the motor current fluctuates as the speed fluctuates, the motor may have a fault. Replacing the motor may correct the fault, but replacing the bridgeplate is an option.
	Failure to sense obstructions or loads. Bridgeplate load sensing is done in the controller by comparing current requirements. If the bridgeplate does not sense an obstruction at deployment or a load retraction, the fault is in the controller.	

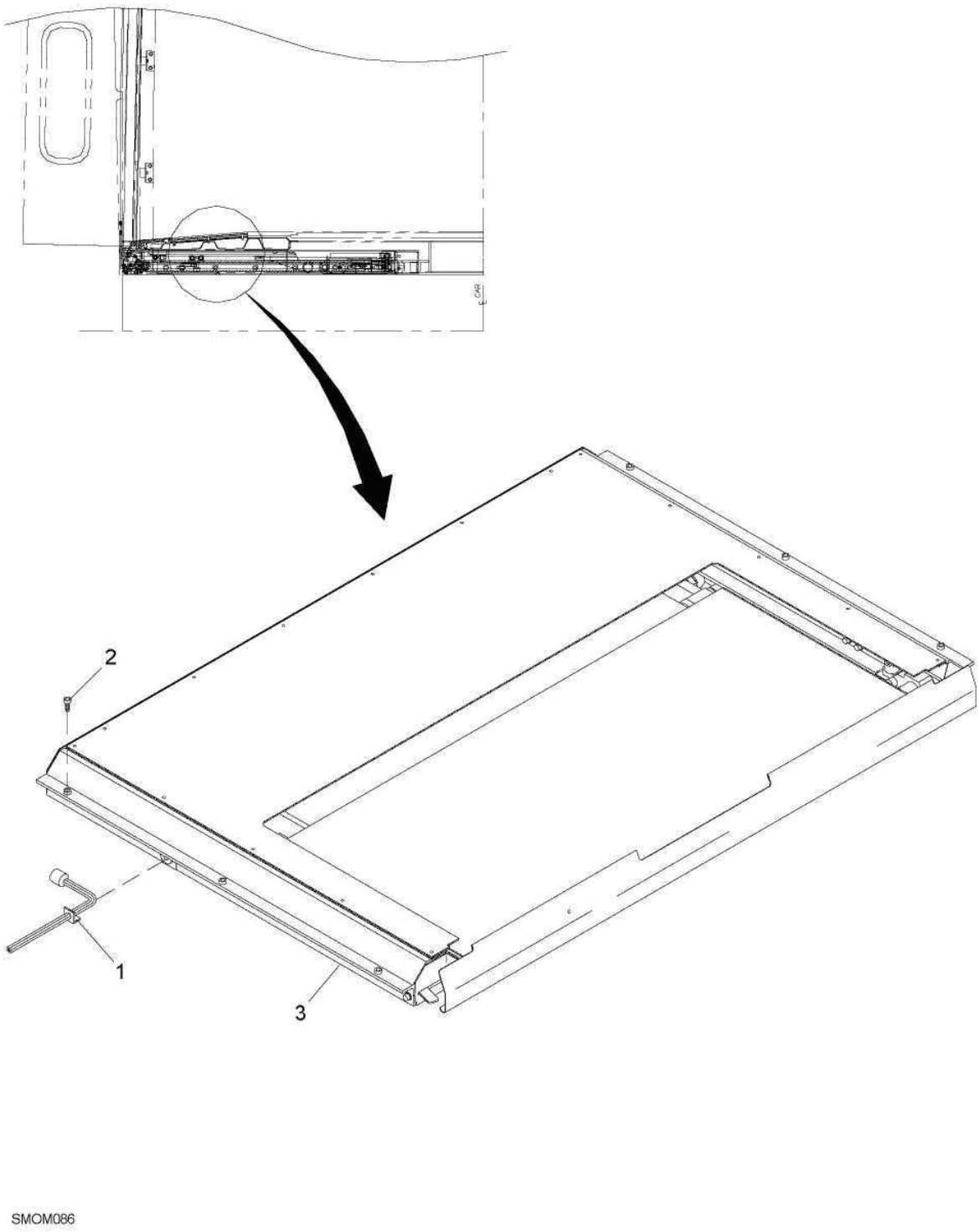

Figure 4-2.66. Removing the Bridgeplate Assembly

ITEM NO.	PART NAME	QTY	ITEM NO.	PART NAME	QTY
1	Fitting Bracket	1	3	Bridgeplate Assembly	1
2	Cap Screw	7			

4-2.2.d Disassembly

- **Reference Information.**
  1. Tools / Equipment.
     – MBTA Overhaul Standard Tools Kit.
  2. Material (Not Applicable).
- **Procedure**

a) Removal

> **WARNING:** **THE BRIDGEPLATE WEIGHS APPROXIMATELY 270 POUNDS AND IS AWKWARD TO LIFT. TO AVOID INJURY, SEEK HELP IN LIFTING. USE SUITABLE LIFTING AIDS SUCH AS AN OVERHEAD CRANE.**

Refer to Figure 4-2.66 Removing the Bridgeplate Assembly, and Figure 4-2.70 Bridgeplate Bottom Cover. Remove the bridgeplate assembly for heavy maintenance as described below.

Refer to section 4-2.2.d a) xviii for side tube location and removal.

Access for removal is from underneath the car. Refer to Figure 4-2.1

1. Open the car doors at the doorway the bridgeplate will be removed from.
2. Shut down the car electric power.
3. Back out the captive screws (1, Figure 4-2.70 Bridgeplate Bottom Cover) with lockwashers (2) and retainers (3) securing the back section of the hinged bottom cover (9). Lower the back section to gain access to the main electrical connector.
4. Disconnect the wiring harness from the car power supply by separating the main electrical connector. Remove the end of the car wiring harness from the side tube (section 4-2.2.d a) xviii). Slide the fitting bracket (1, Figure 4-2.66. Removing the Bridgeplate Assembly) from the wiring cutout in the side tube.
5. Remove seven screws (2) from the bridgeplate mounting flange. Three screws are located at each side of the bridgeplate assembly (3). The remaining screw is located at the back center of the bridgeplate.

6. Close the bottom cover back section to prepare the bridgeplate for removal. Secure the cover section with the captive screws (1, Figure 4-2.66. Removing the Bridgeplate Assembly), lockwashers (2), and retainers (3).

7. Position a wheeled hydraulic hoist beneath the bridgeplate assembly. Place two 60-inch supports, such as 2 x 4 lumber, across the lift platform, positioned so that the ends of the supports will contact and lift on the bridgeplate side tubes.

8. Carefully raise the lift platform until it raises the bridgeplate from the mounting rails. Using the wheeled hoist, guide the bridgeplate assembly from the car opening.

9. If the bridgeplate installation was adjusted by shimming, leave the shims in place for reinstallation of the bridgeplate.

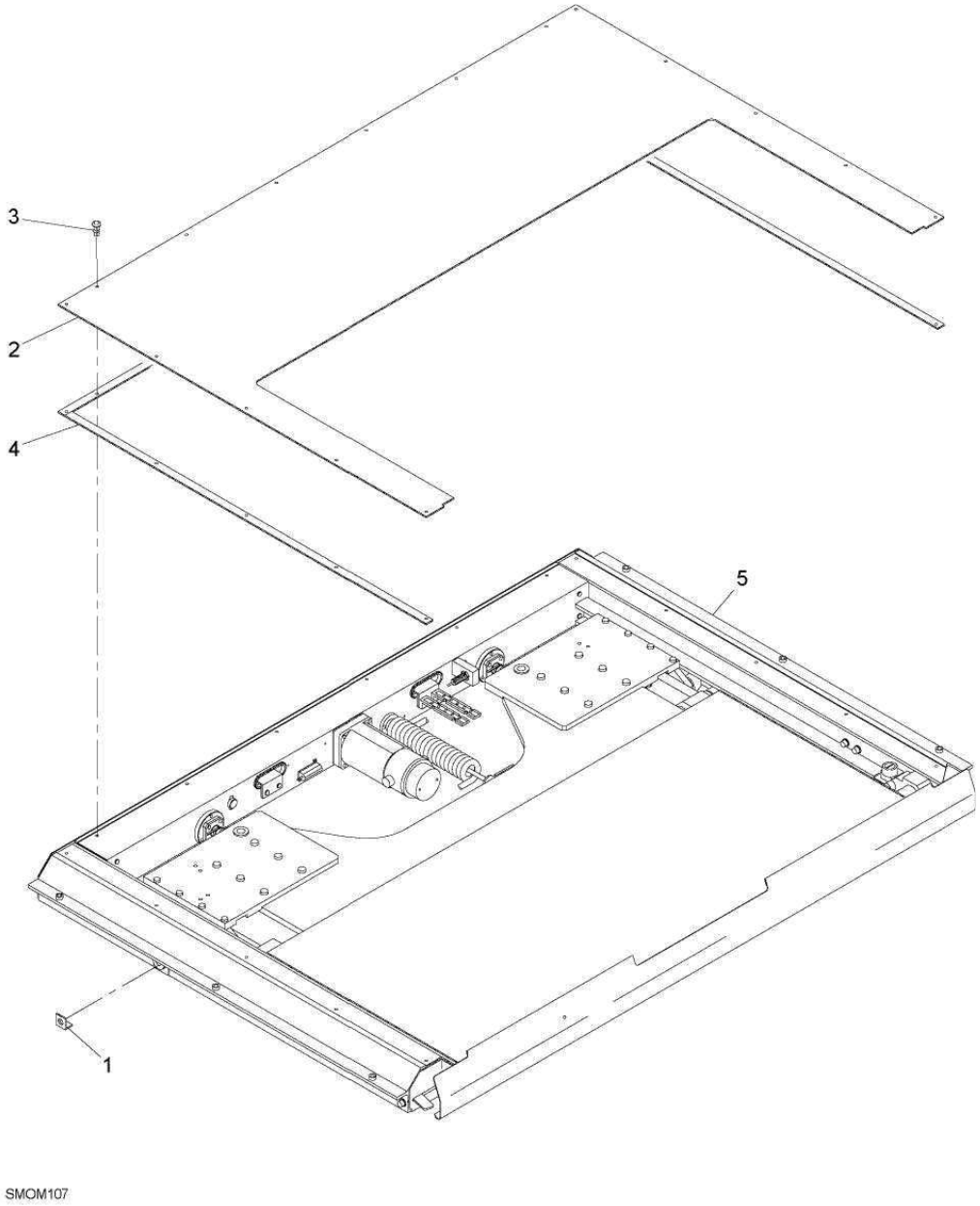

Figure 4-2.67. Bridgeplate Top Cover Assembly

ITEM NO.	PART NAME	QTY	ITEM NO.	PART NAME	QTY
	Bridgeplate Assembly	Ref			
1	Fitting Bracket	Ref	4	Gasket Tape	AR
2	Top Cover	1	5	Bridgeplate	Ref
3	Self-clinch Studs	16			

b) Bridgeplate Disassembly Instructions

General Disassembly Instructions

During scheduled overhauls, remove and discard the following parts and replace them with new:

- All attaching parts
- All springs
- All switches
- All retaining rings
- Drive belts and drive pulleys
- Bellows
- Bearings
- Rollers
- Solenoids
- Wear components

Bridgeplate Disassembly

i) Remove Top Cover

Refer to Figure 4-2.67. Bridgeplate Top Cover Assembly. Remove the top cover as described below.

1. The fitting bracket (1) was removed during removal of the bridgeplate assembly.
2. Remove the cover (2) by removing 16 self-clinch studs (3).
3. Lift off the cover (2).
4. Remove and discard the gasket tape (4).

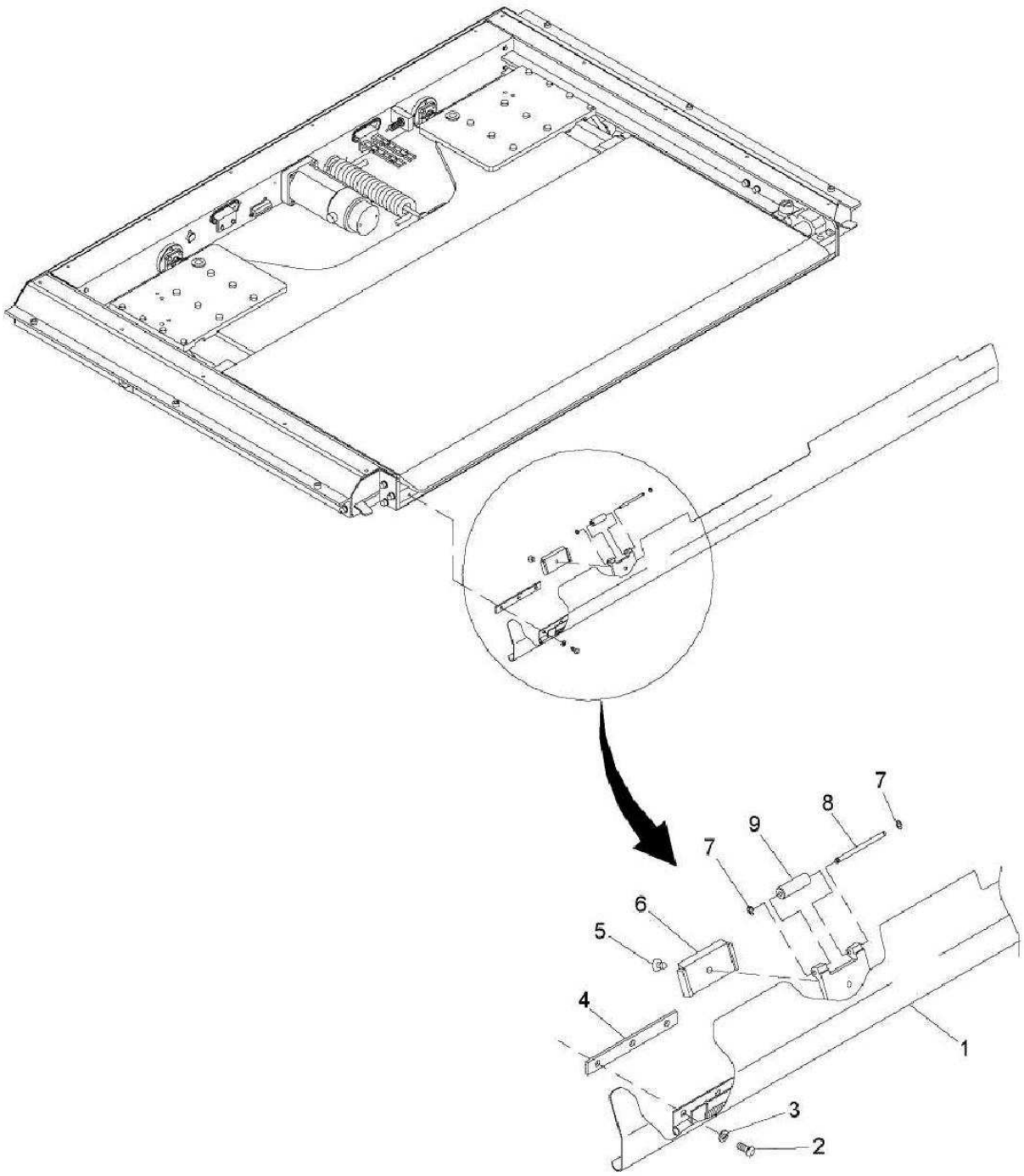

Figure 4-2.68. Bridgeplate Front Cover Assembly

ITEM NO.	PART NAME	QTY	ITEM NO.	PART NAME	QTY
	Bridgeplate Assembly	Ref			
1	Front Cover	1	6	Cover Guide	2
2	Button Head Screw	12	7	Retaining Ring	4
3	Lockwasher	12	8	Roller Shaft	2
4	Spacer	4	9	Roller	2
5	Locking Screw	2			

ii) Remove Front Cover Assembly

Refer to Figure 4-2.68. Bridgeplate Front Cover Assembly. Remove and disassemble the front cover assembly as described below. For this disassembly step the bridgeplate assembly is right side up.

1. Open the front cover (1) and place a suitable block between the cover and the front bar of the bridgeplate to allow access to the front cover hinges.
2. Remove and discard three screws (2) and three lockwashers (3) from each hinge. This frees four spacers (4) and the cover (1) from the bridgeplate assembly.
3. Remove and discard two screws (5) and two cover guides (6).
4. Remove four retaining rings (7), two roller shafts (8), and two rollers (9). Discard the retaining rings and the rollers.

NOTE: The cover is in essence the hinge

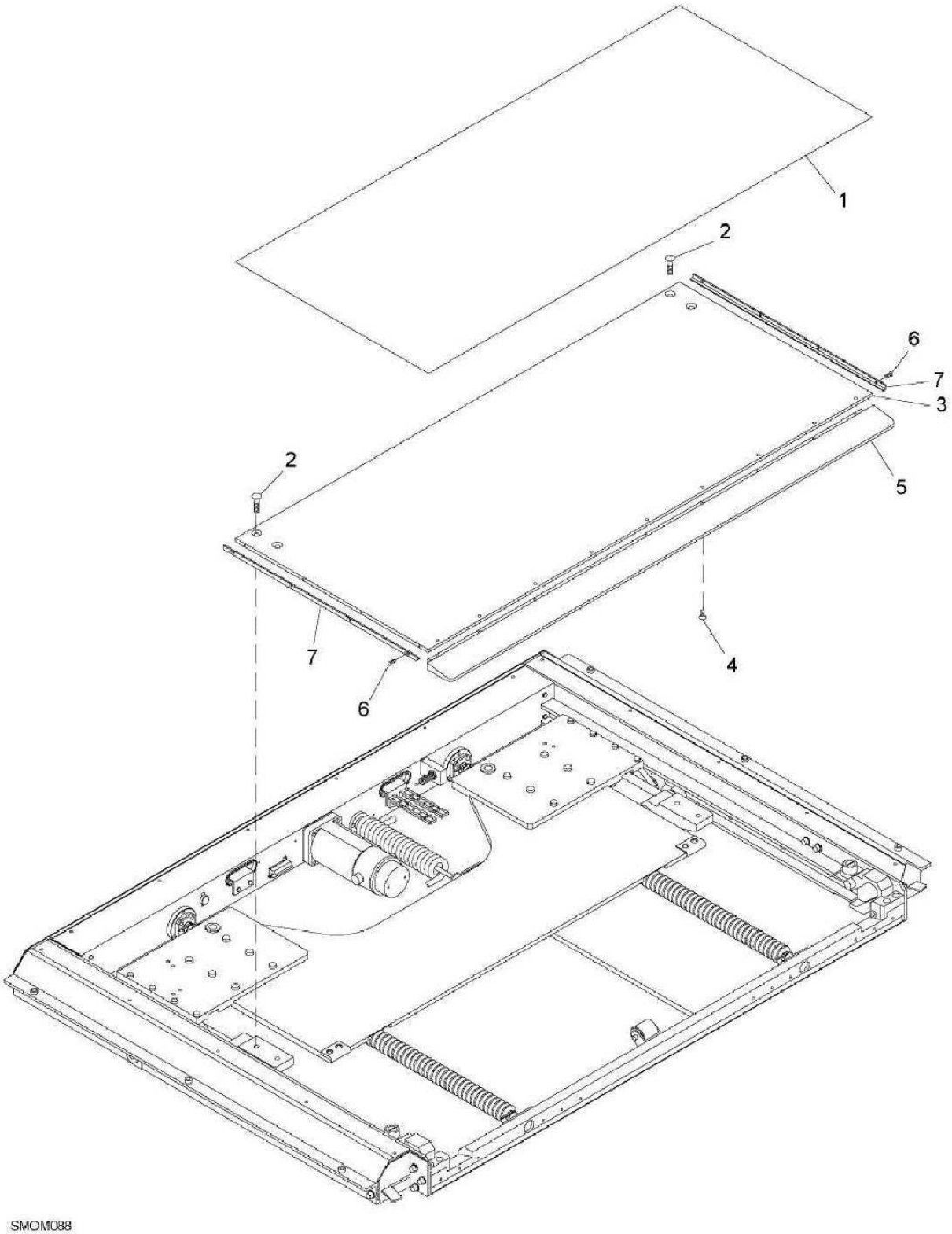

Figure 4-2.69. Bridgeplate Ramp

ITEM NO.	PART NAME	QTY	ITEM NO.	PART NAME	QTY
	Bridgeplate Assembly	Ref			
1	Traction Surface	1	5	Plate Nose	1
2	Locking Screw	4	6	Locking Screw	8
3	Bridgeplate Ramp	1	7	Roller Guide	2
4	Locking Screw	9			

iii) Remove Ramp

Refer to Figure 4-2.69. Bridgeplate Ramp. Remove and disassemble the ramp and associated parts as described below.

NOTE: Using a heat gun to soften the adhesive bonding the traction surface to the ramp will make it easier to peel the traction surface from the ramp. Refer to Install Bridgeplate Ramp, section 4-2.2.h a) xvii, for adhesive information.

WARNING: THE BRIDGEPLATE RAMP WITH THE BRIDGEPLATE NOSE ASSEMBLED WEIGHS 70 POUNDS AND IS AWKWARD TO LIFT. TO AVOID INJURY, SEEK HELP IN LIFTING THESE PARTS OR USE SUITABLE LIFTING AIDS SUCH AS A SLING AND CHAINFALL.

1. Use a scraper to raise one corner of the traction surface (1). Peel the traction surface from the ramp, sliding the scraper between the traction surface and the ramp as necessary to remove the surface. This exposes the screws that secure the ramp to the bridgeplate assembly
2. Remove and discard four screws (2) from the ramp. This frees the ramp (3) from the bridgeplate driving components. With assistance, lift the ramp from the bridgeplate assembly and place it on a bench for further disassembly.
3. Remove and discard nine screws (4) and remove the plate nose (5).
4. Remove and discard eight screws (6) and remove two roller guides (7).

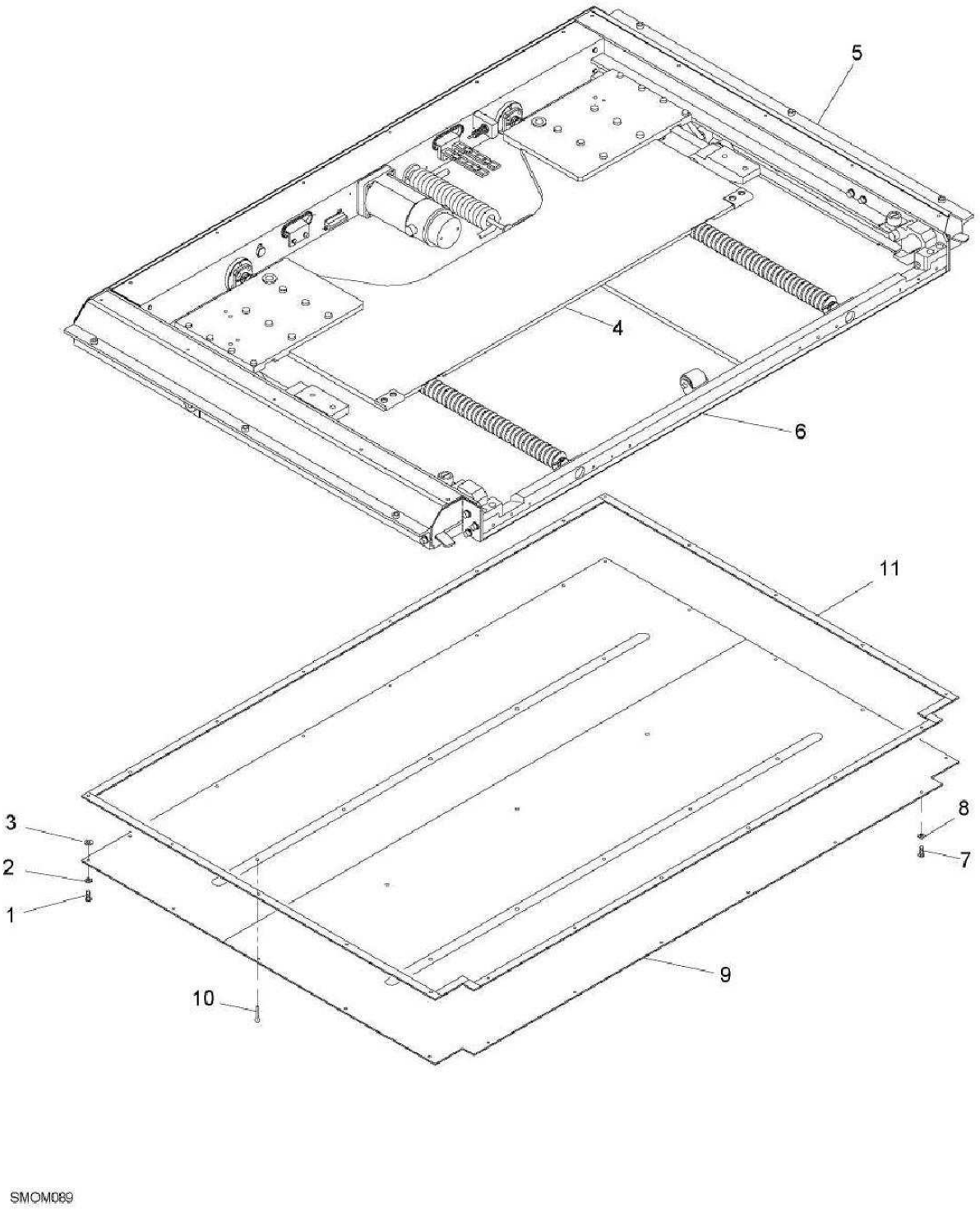

Figure 4-2.70. Bridgeplate Bottom Cover

ITEM NO.	PART NAME	QTY	ITEM NO.	PART NAME	QTY
	Bridgeplate Assembly	Ref			
1	Captive Screw	10	7	Button Head Screw	12
2	Lockwasher	10	8	Lockwasher	12
3	Retainer	10	9	Bottom Cover	1
4	Support Plate	Ref	10	Cotter Pin	12
5	Bridgeplate	Ref	11	Gasket Tape	AR
6	Front Bar	Ref			

iv) Remove Bottom Cover

Refer to Figure 4-2.70. Bridgeplate Bottom Cover. Remove the bridgeplate bottom cover as described below. For this disassembly step the bridgeplate assembly must be upside down.

WARNING: THE BRIDGEPLATE ASSEMBLY WEIGHS APPROXIMATELY 270 POUNDS AND IS AWKWARD TO LIFT. TO AVOID INJURY, SEEK ASSISTANCE TO INVERT THE BRIDGEPLATE ASSEMBLY.

1. Make sure the support plate (4) is completely to the rear, and that both locking pins are engaged.
2. Invert the bridgeplate assembly (5). Rotate the assembly by raising the front bar (6) end of the bridgeplate assembly rather than the rear tube end. The front bar end of the assembly is lighter than the rear tube end, which makes inverting the bridgeplate assembly easier.
3. Release 10 captive screws (1) and their lockwashers (2) and retainers (3). This releases the hinged cover section.
4. Remove the screws (7) and lockwashers (8). Remove the bottom cover (9).
5. Remove any worn or damaged cotter pins (10) from the bottom cover.
6. Remove and discard the gasket tape (11).

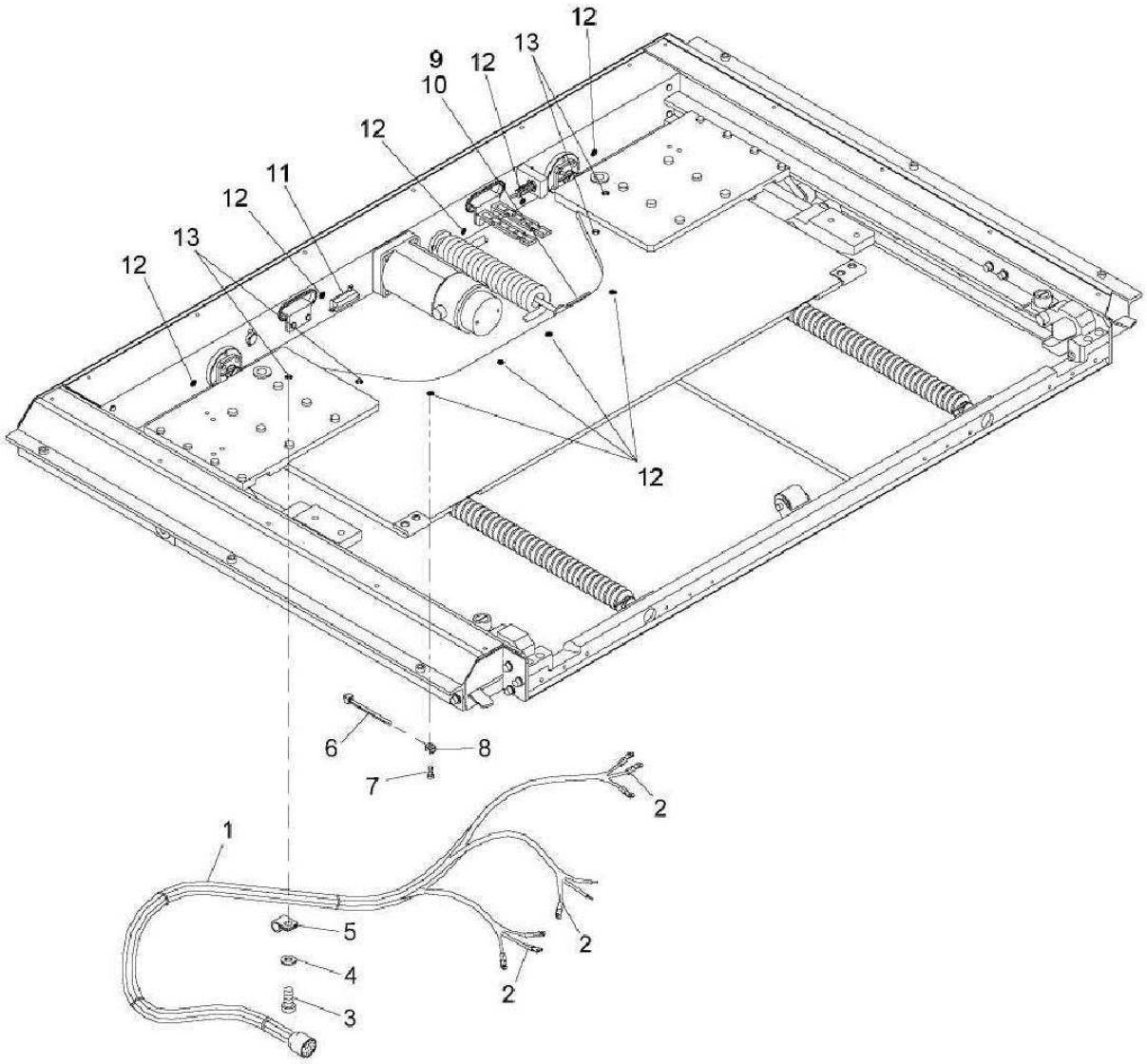

Figure 4-2.71 Bridgeplate Encoder Harness Assembly

ITEM NO.	PART NAME	QTY	ITEM NO.	PART NAME	QTY
	Bridgeplate Assembly	Ref			
1	Encoder Wiring Harness	1	6	Harness Tie	9
2	Heat Shrink Tubing	AR	7	Sem Screw	9
3	Sem Screw	4	8	Tie Mount	9
4	Plain Washer	4	9	Locking Screw	2
5	Loop Clamp	4	10	Cable Bracket	1
			11	Resistor	

v) Remove Encoder Harness

Refer to Figure 4-2.71. Bridgeplate Encoder Harness Assembly. Disconnect and remove the encoder harness and associated parts from the bridgeplate assembly as described below, and disconnect the coiled cord harness from the support plate.

1. Disconnect the encoder wiring harness (1) at all connections. Disconnect from loop clamp (5) at four points (13) and from tie mounts (8) at nine points (12).
2. Slit the heatshrink sleeves (2) at each connection. Peel the sleeve from the connection and separate each knife connector.
3. Desolder the two connections to the 50-watt resistor (11) according to standard electrical shop practice.
4. Using a screwdriver, remove the Sem screw (3) and the plain washer (4), and open the loop clamps (5) to remove the wiring harness (1).
5. Cut and remove the harness ties (6) from the tie mounts on the support plate and the rear tube.
6. Remove nine Sem screws (7), and remove the nine tie mounts (8). The tie mounts are located on the support plate and the rear tube.
7. Remove and discard two screws (9) that connect the cable bracket (10) to the support plate.

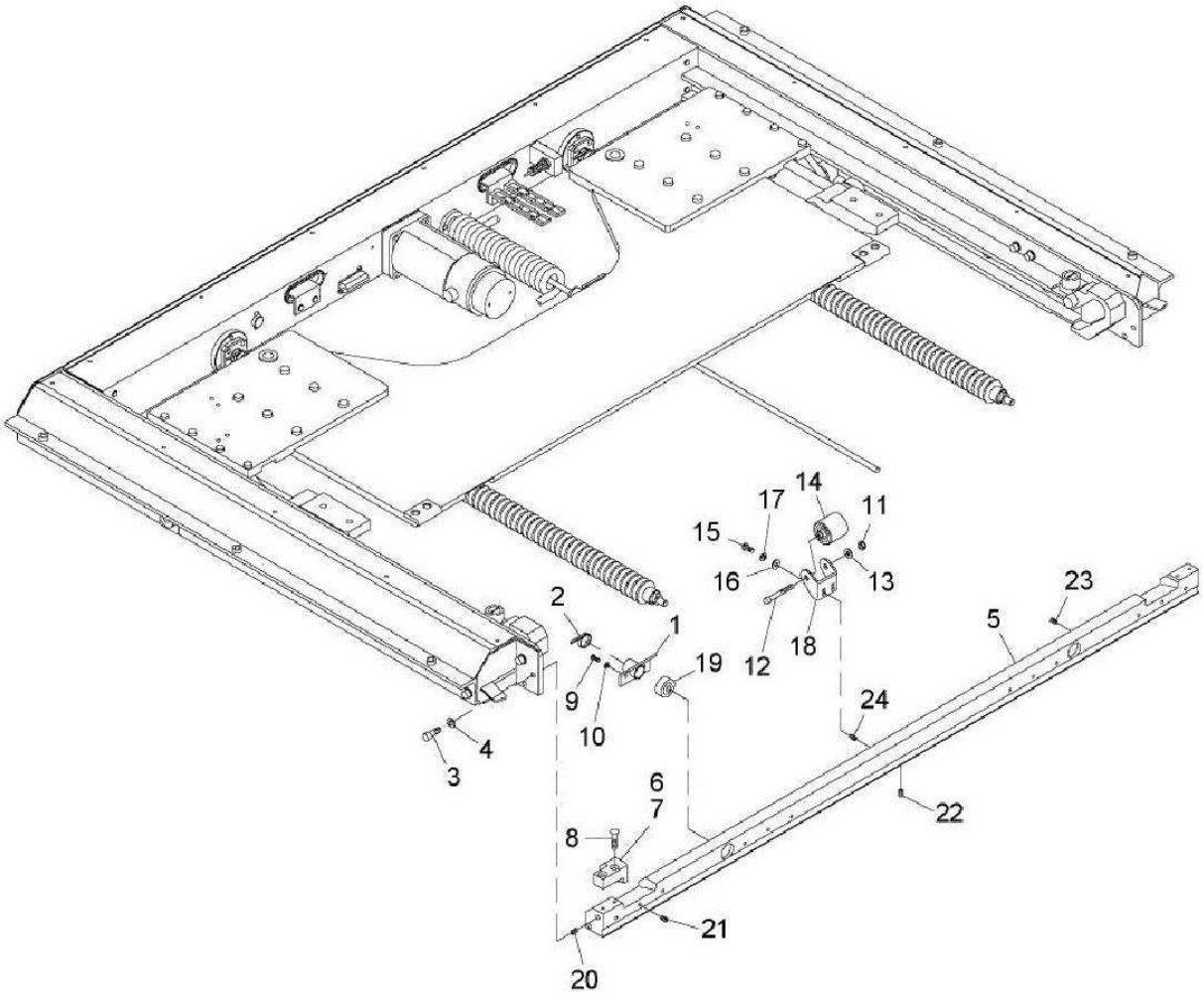

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Figure 4-2.72 Bridgeplate Front Bar Components

ITEM NO.	PART NAME	QTY	ITEM NO.	PART NAME	QTY
	Bridgeplate Assembly	Ref			
1	Front Bellows Bracket	2	13	Plain Washer	1
2	Harness Tie	2	14	Roller	1
3	Cap Screw	4	15	Button Head Screw	2
4	Lockwasher	4	16	Plain Washer	2
5	Front Bar	1	17	Lockwasher	2
6	Guide Ramp	1	18	Roller Bracket	1
7	Guide Ramp	1	19	Bearing	2
8	Locking Screw	4	20	Helical Insert	4
9	Button Head Screw	4	21	Helical Insert	12
10	Lockwasher	4	22	Helical Insert	4
11	Locknut	1	23	Helical Insert	4
12	Shoulder Screw	1	24	Helical Insert	2

vi) Remove Front Bar

Refer to Figure 4-2.72. Bridgeplate Front Bar Components. Remove and disassemble the front bar and associated components as described below.

1. Release the bellows at the front bellows brackets (1) by cutting the harness ties (2).
2. Remove and discard two screws (3) and lockwashers (4) from each end of the front bar (5). This frees the front bar and associated components from the bridgeplate frame.
3. To remove the guide ramps (6 and 7), remove and discard two torque patch screws (8) from each guide ramp.
4. Remove and discard two buttonhead screws (9) and lockwashers (10) from each bellows bracket (1). Remove the bellows brackets from the front bar.
5. Turn the locknut (11) from the shoulder screw (12), and remove the screw, washer (13), and roller (14). Discard these parts.
6. Remove and discard two buttonhead screws (15), plain washers (16), and lockwashers (17), and remove the roller bracket (18).
7. Use an arbour press to press two bearings (19) from the front bar bearing bores. Discard the bearings.
8. Remove and discard the helical inserts (20, 21, 22, 23, and 24) from the front bar as described below.

9. Using a pointed tool, tip the lead thread on the insert into the center of the bore

10. Grasp the coil with needle nose pliers and pull the coil straight outward. The insert will uncoil and come out of the bore

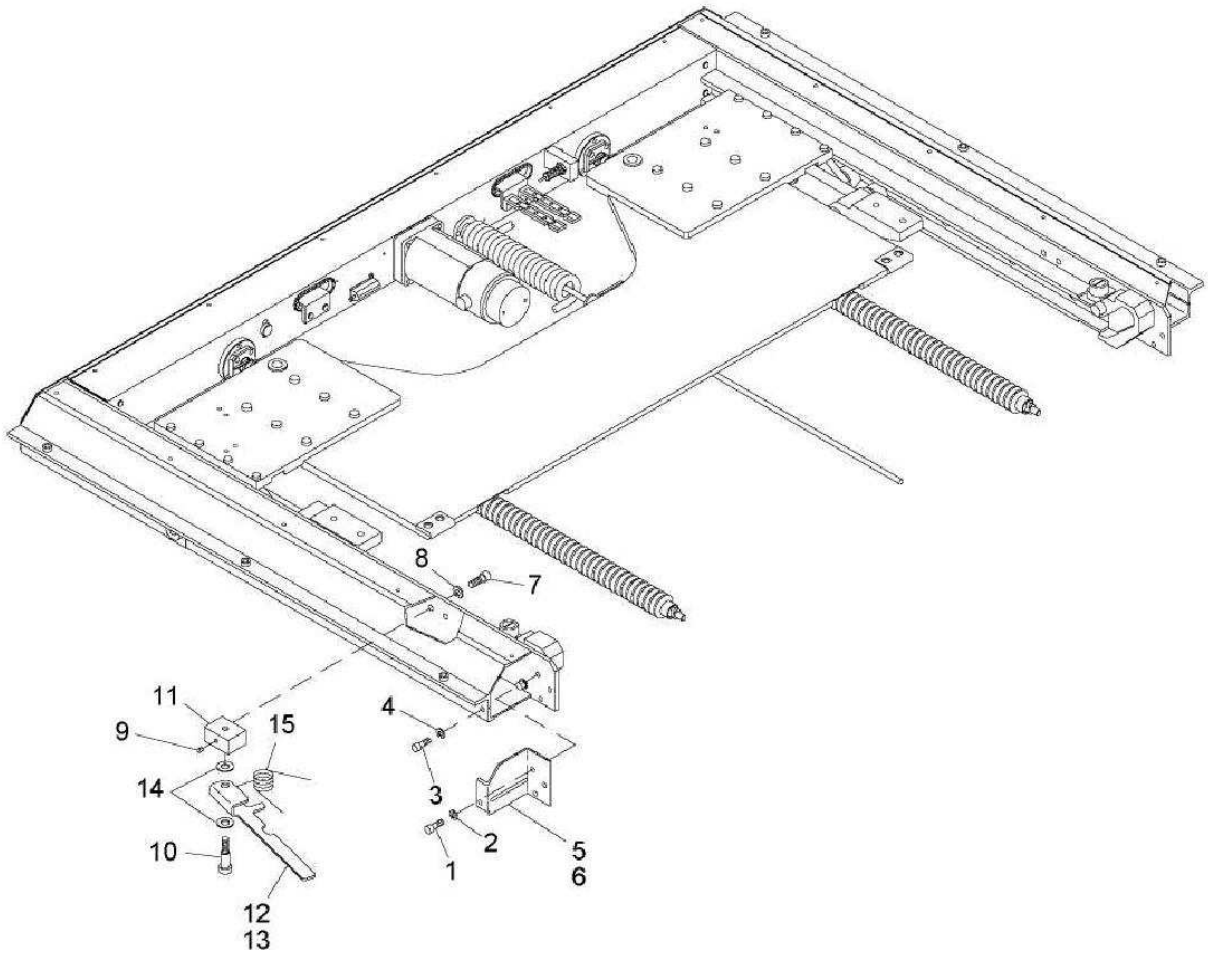

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Figure 4-2.73 Bridgeplate Locking Lever Components

ITEM NO.	PART NAME	QTY	ITEM NO.	PART NAME	QTY
	Bridgeplate Assembly	Ref			
1	Cap Screw	4	9	Setscrew	2
2	Lockwasher	4	10	Shoulder Screw	2
3	Button Head Screw	2	11	Block	2
4	Lockwasher	2	12	Locking Lever	1
5	Tube Cover Bracket	1	13	Locking Lever	1
6	Tube Cover Bracket	1	14	Thrust Washer	4
7	Cap Screw	4	15	Torsion Spring	2
8	Lockwasher	4			

vii) Remove Locking Lever

Refer to Figure 4-2.73. Bridgepnate Locking Lever Components Remove the tube cover bracket and the locking lever and associated parts as described below.

1. Remove and discard the screws (1) and lockwashers (2) and the screws (3) and lockwashers (4) to free the tube cover brackets (5 and 6).
2. Remove the locking levers as assemblies. Remove and discard the cap screws (7) and lockwashers (8). This frees the locking levers and associated components.
3. Disassemble the lever components as follows:
4. Back out the setscrew (9) to allow the shoulder screw (10) to be removed.
5. Hold the block (11) and remove the shoulder screw (10). This frees the lever (12 or 13), the thrust washers (14), and the torsion spring (15).

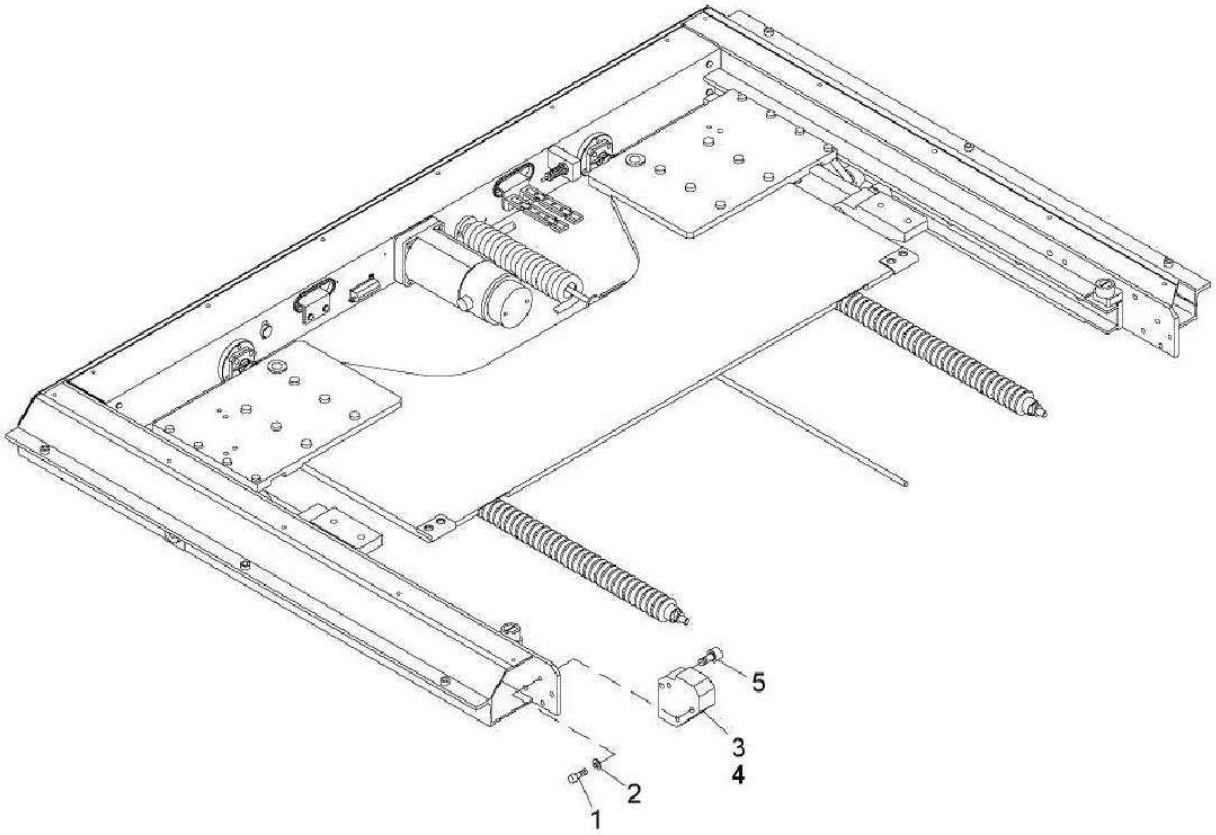

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Figure 4-2.74. Bridgeplate Front Guide Blocks

ITEM NO.	PART NAME	QTY	ITEM NO.	PART NAME	QTY
	Bridgeplate Assembly	Ref			
1	Cap Screw	4	4	Guide Block	1
2	Lockwasher	4	5	Cam Follower Bearing	2
3	Guide Block	1			

viii) Remove Front Guide Blocks

Refer to Figure 4-2.74. Bridgeplate Front Guide Blocks. Remove and disassemble the front guide blocks as described below.

WARNING: WHEN THE GUIDE BLOCKS ARE REMOVED THE SUPPORT PLATES AND CARRIAGE ASSEMBLIES ARE FREE TO SLIDE FORWARD, WHICH COULD RESULT IN INJURY. MAKE SURE THE BRIDGEPLATE ASSEMBLY IS LEVEL, AND THAT THE LOCKING PINS ARE ENGAGED BEFORE REMOVING THE GUIDE BLOCKS

1. Remove and discard two screws (1) and lockwashers (2) from the side tube to free each guide block (3 and 4).
2. Hold the guide block and remove the cam follower bearings (5). Discard the cam follower bearings

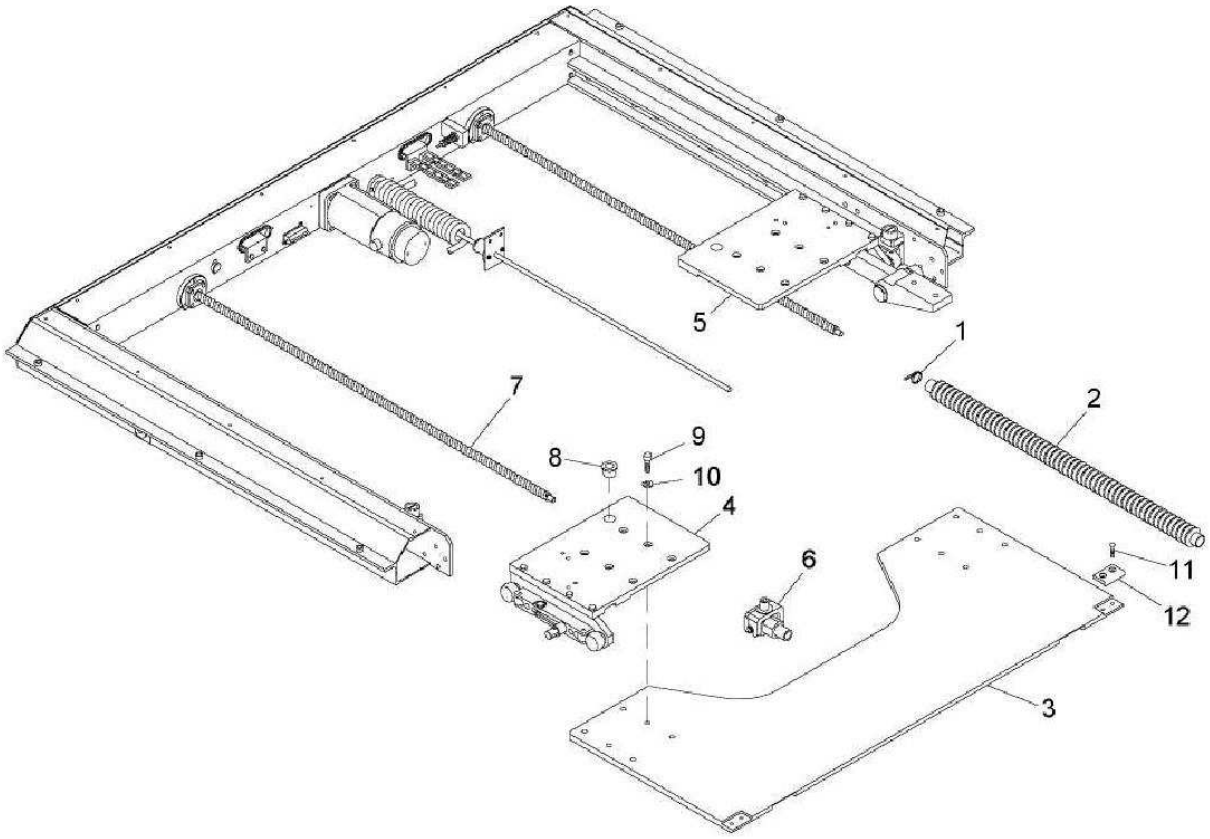

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Figure 4-2.75 Bridgeplate Support and Carriage Plates

ITEM NO.	PART NAME	QTY	ITEM NO.	PART NAME	QTY
	Bridgeplate Assembly	Ref			
1	Harness Tie	2	7	Ballscrew	Ref
2	Bellows	2	8	Carriage Bushing	2
3	Support Plate	1	9	Cap Screw	12
4	Carriage Plate (refer to Figure 4-2.75 through Figure 4-2.77)	Ref	10	Lockwasher	12
5	Carriage Plate	Ref	11	Locking Screw	4
6	Ballnut (refer to Figure 4-2.76)	Ref	12	Wear Pad	2

ix) Remove Carriage Plates

Refer to Figure 4-2.75 Bridgeplate Support and Carriage Plates and Figure 4-2.76. Bridgeplate Ballnut Components. Remove and disassemble the carriage plates and components from the support plate as described below.

NOTE: **Removing the support plate and carriage plates and components also removes the ballnut from the ball screws, as described in step b, below. This will require assistance to transfer the ballnuts to temporary tubes to avoid losing the ballnut balls.**

CAUTION: **DURING REMOVAL OF THE BALLNUT, USE A TOOL AS DESCRIBED BELOW TO PREVENT LOSS OF THE BEARING BALLS IN THE BALLNUTS. IF THE BEARING BALLS ARE LOST, BOTH THE BALLNUT AND BALLSCREW MUST BE REPLACED**

1. Cut and remove the harness tie (1) that secures each bellows (2) to the rear bellows bracket and remove the bellows.
2. Slide the support plate (3) and carriage plates (4 and 5) and components away from the rear tube. This will move the ballnuts (6) and associated parts toward the free end of the ballscrews (7).
3. Before the ballnuts (6) reach the end of the threaded portion of the ballscrew (7) position a removal tool at the end of each ballscrew to accept the ballnuts as they reach the end of the ballscrew threads. Use a length of metal tubing 5 to 6 inches long, with a 3/8-inch inside diameter and 1/2-inch outside diameter. Place the tubing over the free end of each ballscrew and against the end of the threads.

4. As the ballnut (6) reaches the end of the threaded length of the ballscrews (7), the bearing balls will remain in the ballnut, captured and supported by the tubes. When the ballnuts are on the tubes, the ballnuts and associated parts can be removed from the carriage plates by lifting the yokes from the carriage bushings (8).
5. Use a cable tie inserted through the tube and locked around the ballnut (6) and parts to prevent the tube and ballnut from separating.
6. Pull the support plate and carriage plates toward the open end of the bridgeplate framework. When the cam follower bearings clear the end of the roller channels the support plate and carriage plates are free of the bridgeplate framework.
7. Invert the support plate and carriage plates.
8. Lift the bushing (8) from each carriage plate.
9. Separate the carriage plates (4 and 5) from the support plate (3) by removing six screws (9) and lockwashers (10) from each carriage plate.
10. Remove and discard four screws (11) and two wear pads (12).

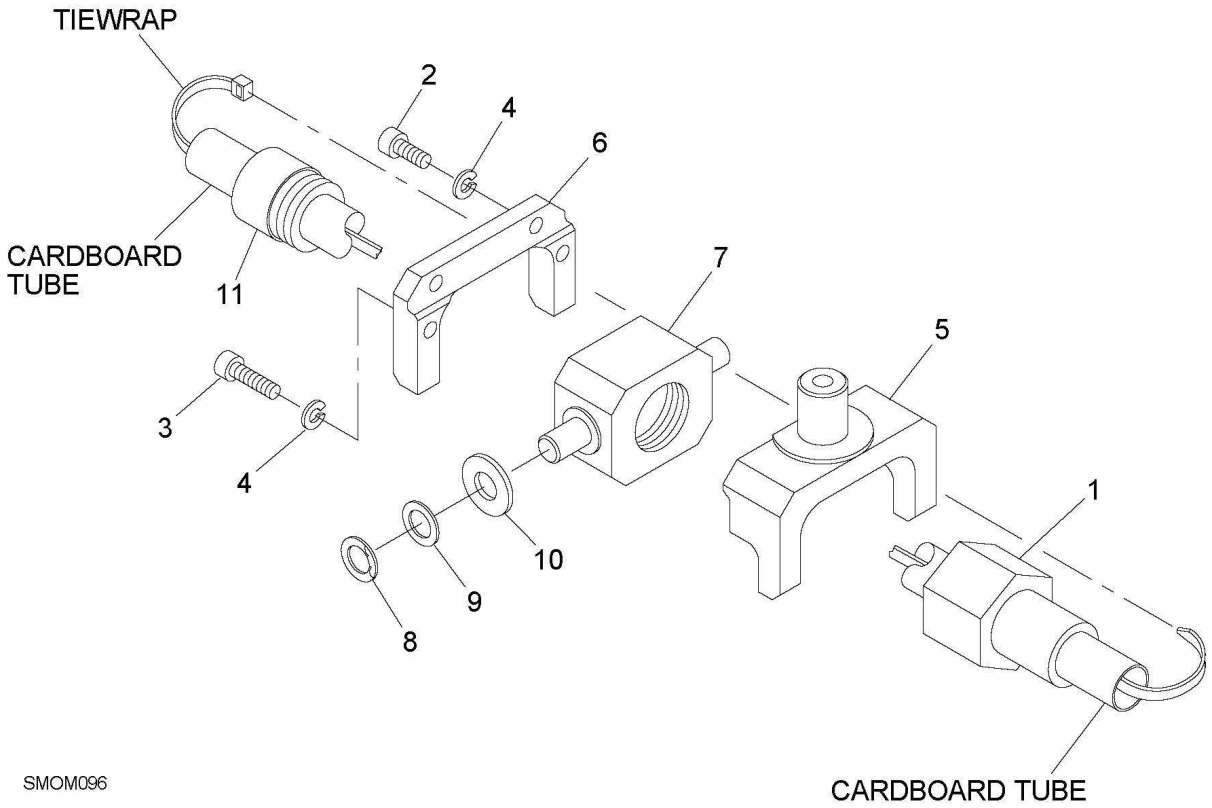

Figure 4-2.76 Bridgeplate Ballnut Components

ITEM NO.	PART NAME	QTY	ITEM NO.	PART NAME	QTY
	Bridgeplate Assembly	REF			
1	Bellows Bracket	2	7	Nut Housing	2
2	Cap Screw	4	8	Retaining Ring	4
3	Cap Screw	4	9	Nylon Bearing	4
4	Lockwasher	8	10	Insulating Washer	4
5	Yoke	2	11	Ballnut	2
6	Yoke Retainer	2			

x) Disassemble Ballnut

Refer to Figure 4-2.76. Bridgeplate Ballnut Components. Disassemble the ballnut and associated parts as described below.

CAUTION: DO NOT REMOVE THE BALLNUT FROM THE TUBE USED AS A TOOL DURING REMOVAL. IF THE BALL NUT IS REMOVED FROM THE TUBE, THE BEARING BALLS WILL FALL OUT, WHICH CAN RESULT IN THE BALLNUT BEING SCRAPPED

1. Turn the bellows bracket (1) from the ballnut components.
2. Remove two screws (2), two screws (3), and four lockwashers (4) from each yoke (5) and yoke retainer (6). This frees the yoke and yoke retainer from the nut housing (7). Discard the screws and washers.
3. Remove two retaining rings (8), two nylon bearings (9), and two insulating washers (10) from each nut housing.
4. Turn the nut housing (7) from the ballnut (11). Do not remove the ballnut from the tube used as a removal tool.
5. Place a harness tie through the tube and around the ballnut to retain the ballnut on the tube.

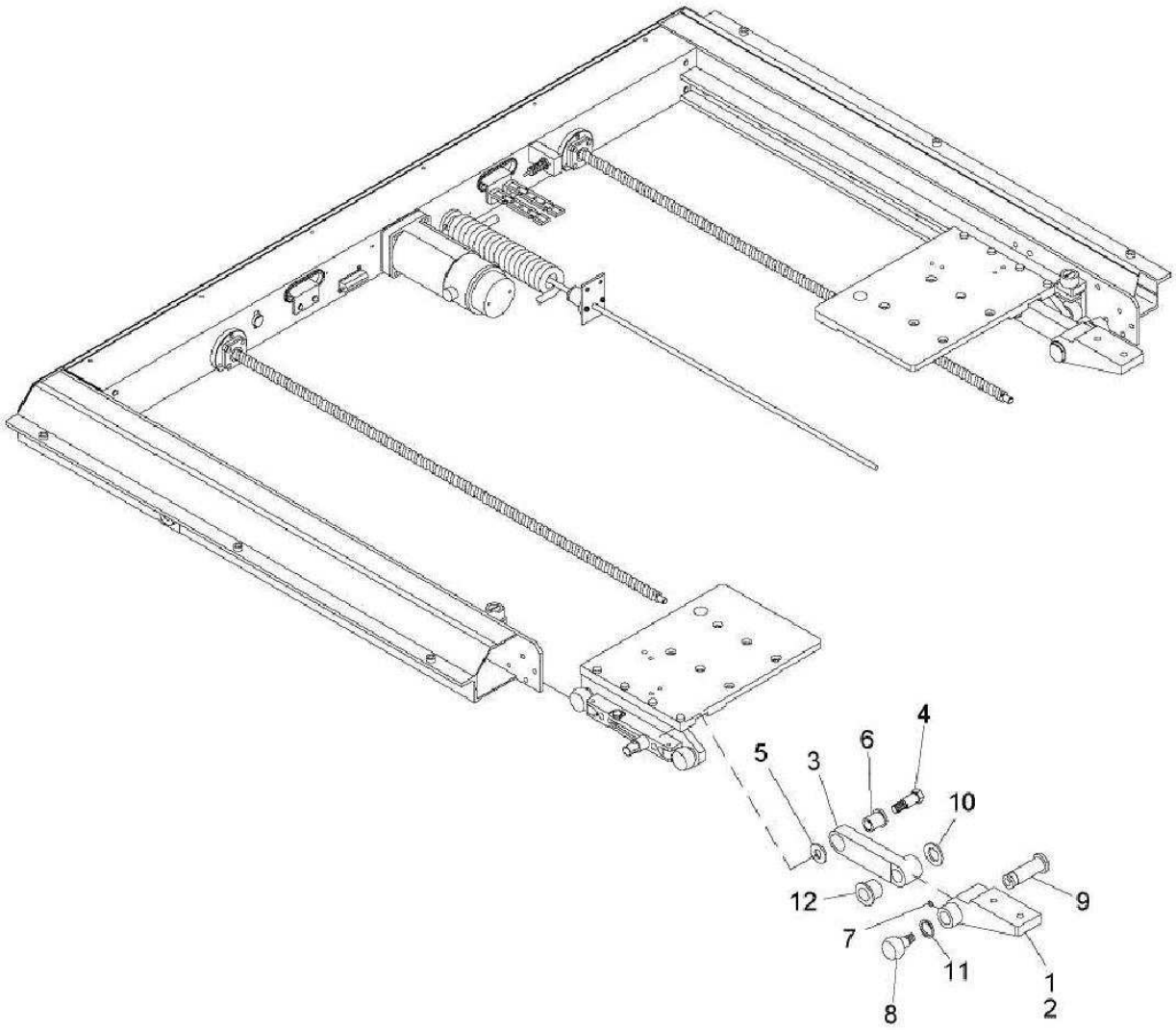

Figure 4-2.77 Bridgeplate Clevis and Link Components

ITEM NO.	PART NAME	QTY	ITEM NO.	PART NAME	QTY
	Bridgeplate Assembly	Ref			
1	Clevis, RH	1	7	Set Screw	2
2	Clevis, LH	1	8	Cam Follower Bearing	2
3	Link	2	9	Link Pin	2
4	Shoulder Screw	2	10	Thrust Washer	2
5	Thrust Washer	2	11	Hardened Washer	2
6	Bushing	2	12	Bushing	2

xi) Remove Clevis and Link

Refer to Figure 4-2.77 Bridgeplate Clevis and Link Components. Remove and disassemble the clevis and link and related components as described below.

1. Remove the clevis (1 and 2) and link (3) from each carriage side plate by removing the shoulder screw (4). Remove the thrust washer (5) and the bushing (6).
2. Separate the clevis and link. Back out the setscrew (7) far enough to allow the bearing (8) and link pin (9) to be disassembled.
3. Place an appropriate Allen wrench on the wrenching socket on the cam follower bearing (8). Use a second wrench to turn the link pin (9) from the cam follower bearing.
4. Pull the link pin from the clevis. This frees the thrust washers (10), the hardened washers (11), and the bushings (12) and separates the link and clevis.

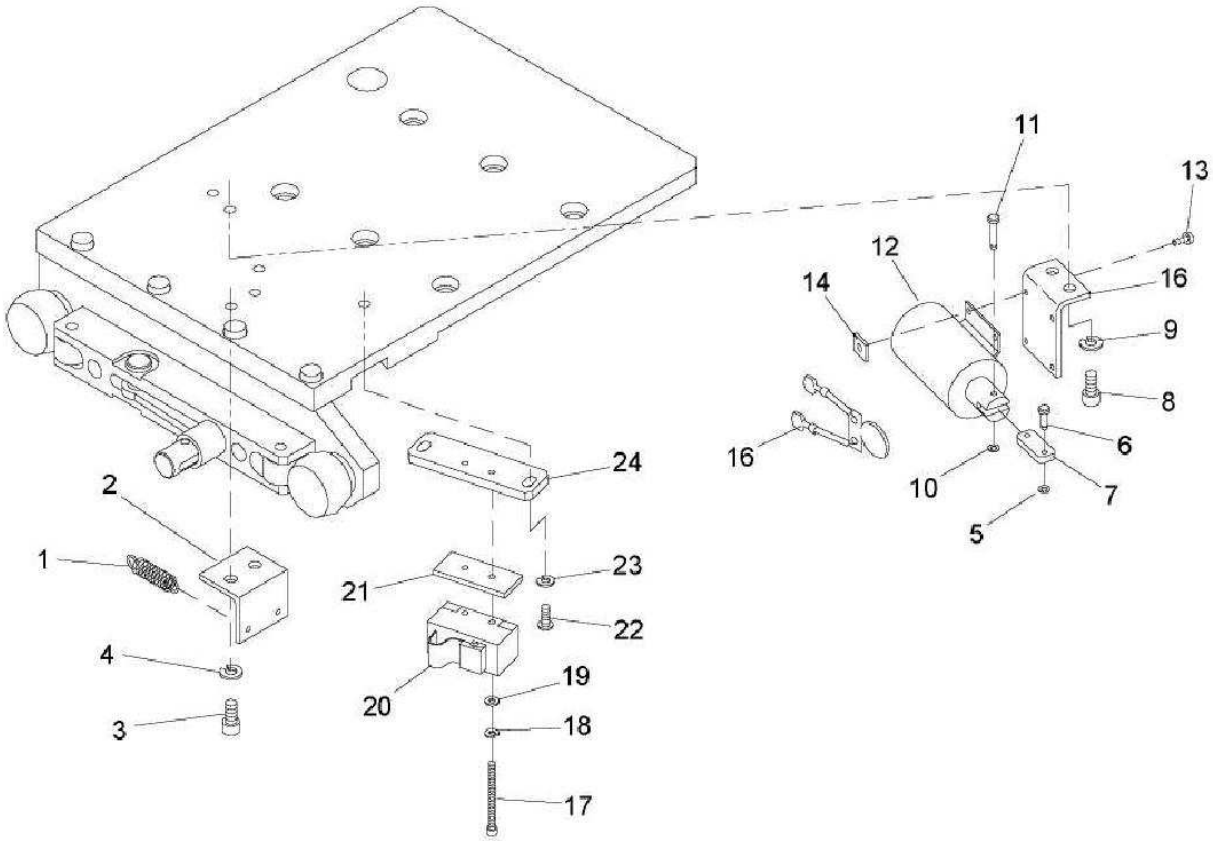

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Figure 4-2.78. Bridgeplate Solenoid and Lever Switch Components

ITEM NO.	PART NAME	QTY	ITEM NO.	PART NAME	QTY
	Bridgeplate Assembly	Ref			
1	Tension Spring	2	13	Screw	8
2	Spring Bracket	2	14	Backing Plate	8
3	Cap Screw	4	15	Suppressor	2
4	Lockwasher	4	16	Solenoid Bracket	2
5	Retaining Ring	4	17	Screw	4
6	Link Pin	2	18	Lockwasher	4
7	Link	2	19	Plain Washer	4
8	Cap Screw	4	20	Switch	2
9	Lockwasher	4	21	Switch Insulator	2
10	Retaining Ring	2	22	Screw	4
11	Link Pin	2	23	Lockwasher	4
12	Solenoid	2	24	Switch Support	2

xii) Remove Solenoids and Lever Switches

Refer to Figure 4-2.78 Bridgeplate Solenoid and Lever Switch Components, and Figure 4-2.79. Bridgeplate Carriage Side Plate Components. Remove and disassemble the solenoids, lever switches, and related components as described below.

1. Disconnect each spring (1, Figure 4-2.78) from its spring bracket (2) and then from its lock plate (16, Figure 4-2.79). Discard the springs.
2. Refer to Figure 4-2.78
3. Remove and discard two screws (3) and two lockwashers (4) to remove each spring bracket (2)
4. Remove and discard the retaining rings (5) from the link pins (6) that connect the links (7) and the lock plates.
5. Remove and discard two screws (8) and lockwashers (9), and remove each solenoid and bracket. Disassemble the solenoid and bracket components as follows:
6. Remove and discard the retaining ring (10) from the link pin (11) that connects the link (7) and the solenoid (12).
7. Remove and discard four screws (13) and backing plates (14) that secure the solenoid (12) to the solenoid bracket (16). Remove the suppressor (15) from each solenoid (12).

8. Remove and discard two screws (17), lockwashers (18), and plain washers (19). Remove each lever switch (20) and switch insulator (21).

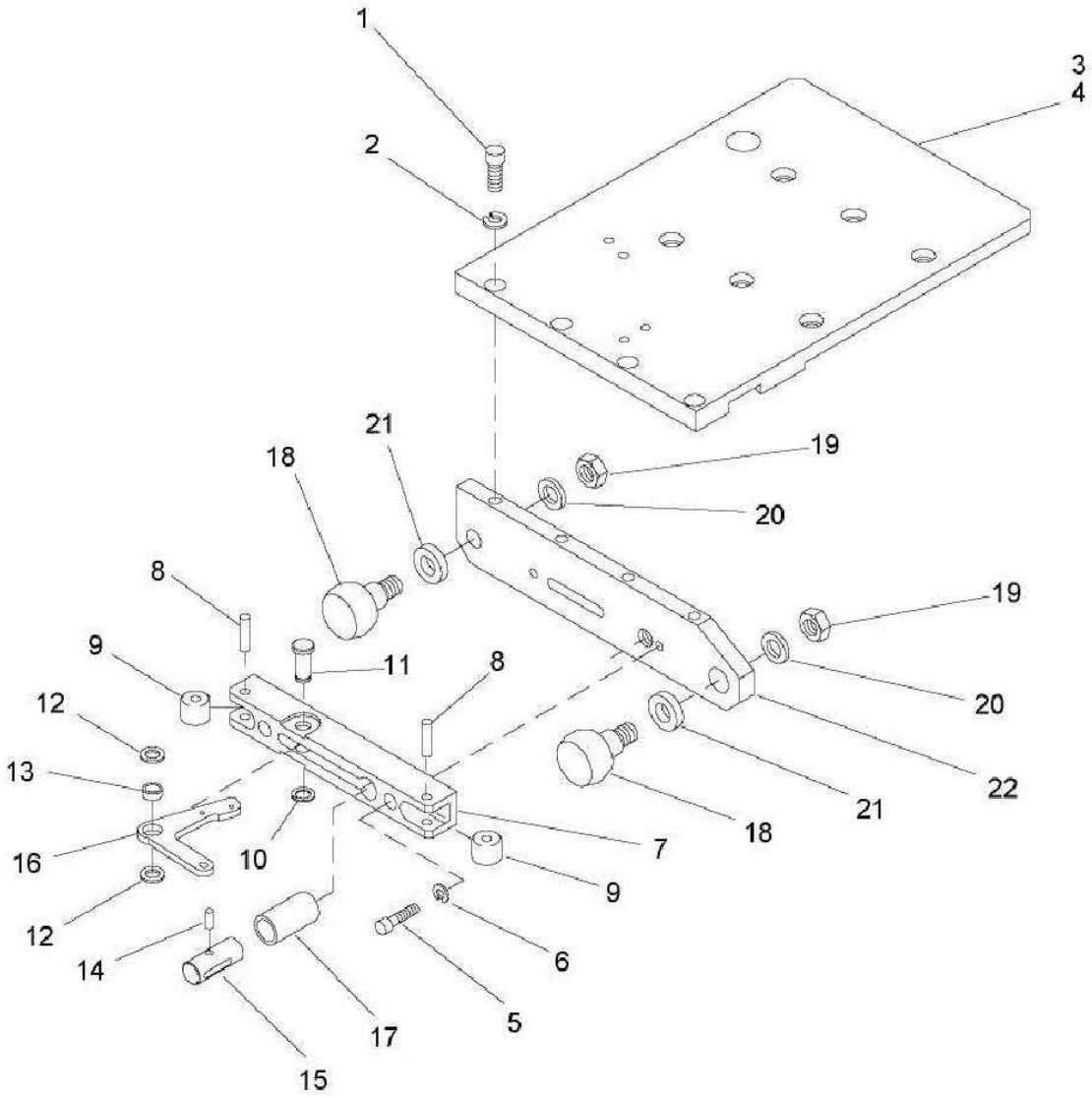

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Figure 4-2.79 Bridgeplate Carriage Side Plate Components

ITEM NO.	PART NAME	QTY	ITEM NO.	PART NAME	QTY
	Bridgeplate Assembly	Ref			
1	Cap Screw	8	12	Thrust Washer	4
2	Lockwasher	8	13	Bushing	2
3	Carriage Plate, R.H.	1	14	Pin	2
4	Carriage Plate, L.H.	1	15	Lock Pin	2
5	Cap Screw	4	16	Lock Plate	2
6	Lockwasher	4	17	Lock Pin Bushing	2
7	Guide Bar	2	18	Cam Follower Bearing	4
8	Dowel Pin	4	19	Jam Nut	4
9	Roller Bearing	4	20	Lockwasher	4
10	Retaining Ring	2	21	Cam Spacer	4
11	Lock Pin	2	22	Carriage Side Plate	2

9. Remove and discard two screws (22) and lockwashers (23). Remove the switch support (24)

xiii) Remove Carriage Side Plates

Refer to Figure 4-2.79 Bridgeplate Carriage Side Plate Components. Remove and disassemble the carriage side plates and related components as described below.

1. Remove and discard eight screws (1) and eight washers (2) and separate each carriage side plate (22) and components from the carriage plates (3 and 4).
2. Remove and discard two screws (5) and lockwashers (6), and separate each guide bar (7) and components from each carriage side plate and components. Disassemble each guide (7) bar and components as follows.
    a. Press two dowel pins (8) from each guide bar (7) and roller bearings (9). Discard the dowel pins and the roller bearings.
    b. On each guide bar, remove and discard the retaining ring (10). Press out the lock pin (11), which releases the lock plate and associated parts, two thrust washers (12), and bushing (13).
    c. Press the pin (14) from the lock pin (15) and lock plate (16). Discard the pin.

d. Do not remove the lock pin bushing (17) from either guide bar unless it is loose or the ID has become bellmouthed or elliptical. If it is necessary to remove the bushing, press it from the guide bar and discard it.

3. Hold the cam follower bearings (18) with an appropriate Allen wrench. Turn the two jam nuts (19) from the cam follower bearings. Remove the bearings, the lockwashers (20), and the cam spacers (21) from the carriage side plates (22)

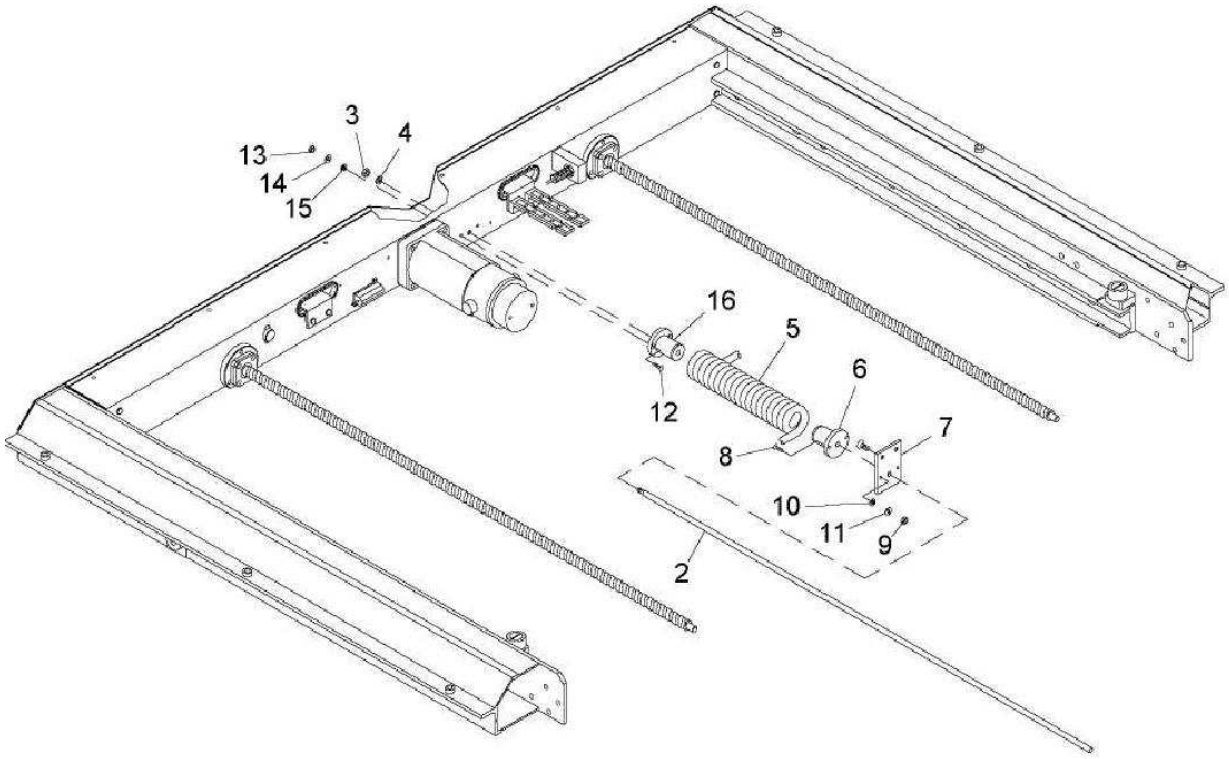

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Figure 4-2.80. Bridgeplate Coiled Cord Harness and Associated Parts

ITEM NO.	PART NAME	QTY	ITEM NO.	PART NAME	QTY
	Bridgeplate Assembly	Ref			
1*	Connector Sleeve	AR	9	Hex Nut	2
2	Support Rod	1	10	Plain Washer	2
3	Hex Nut	1	11	Lockwasher	2
4	Lockwasher	1	12	Sem Screw	2
5	Coiled Cord Harness	1	13	Hex Nut	2
6	Front Cable Spool	1	14	Lockwasher	2
7	Cable Bracket	1	15	Plain Washer	2
8	Flat Head Screw	2	16	Rear Cable Spool	1

* = item not illustrated

xiv) Remove Coiled Cord Harness

Refer to Figure 4-2.80. Bridgeplate Coiled Cord Harness and Associated Parts. Remove and disassemble the coiled cord harness and associated parts as described below.

1. If the coiled cord harness (5) is still connected to the main bridgeplate electrical harness disconnect it by slitting the connector sleeves (1) at each connection, peeling the sleeve from the connection, and separating each knife connector.
2. Hold the support rod (2) with vise grips. Remove and discard the nut (3) and lockwasher (4). Remove the rod from the rear cable mount and the remaining components. This frees the coiled cord harness (5).
3. Separate the front cable spool (6) from the cable bracket (7) by removing two screws (8), nuts (9), lockwashers (11), and plain washers (10). Discard these attaching parts.
4. Remove and discard two screws (12), two hex nuts (13), lockwashers (14), and plain washers (15), and dismount the rear cable spool (16).

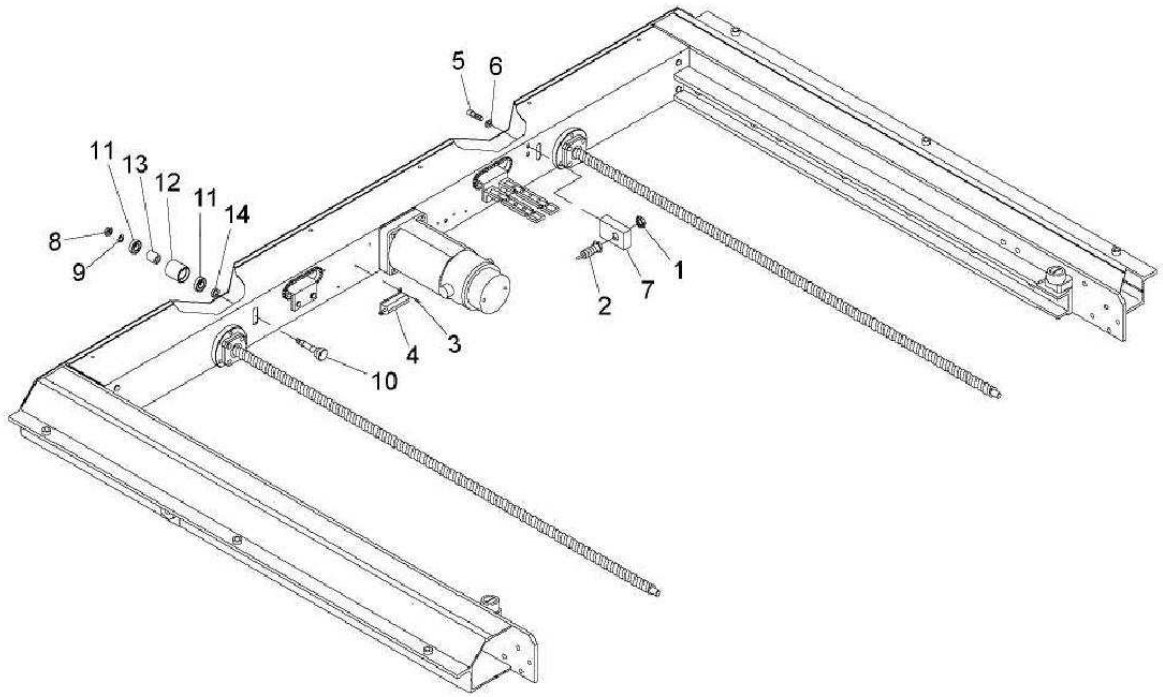

Figure 4-2.81 Bridgeplate Rear Tube Mounted Parts

ITEM NO.	PART NAME	QTY	ITEM NO.	PART NAME	QTY
	Bridgeplate Assembly	Ref			
1	Jam Nut	1	8	Locknut	2
2	Proximity Sensor	1	9	Special Washer	2
3	Sem Screw	2	10	Tensioner Shaft	2
4	50 Watt Resistor	1	11	Bearing	4
5	Cap Screw	2	12	Roller	2
6	Lockwasher	2	13	Spacer	2
7	Sensor Mounting Bracket	1	14	Spacer	2

xv) Remove Rear Tube Mounted Parts

Refer to Figure 4-2.81 Bridgeplate Rear Tube Mounted Parts. Remove the proximity sensor, the 50-watt resistor, and the belt tensioners as described below.

1. Remove the jam nut (1). This frees the proximity sensor (2).
2. Remove and discard two screws (3), and remove the 50-watt fixed resistor (4).
3. Remove and discard two screws (5) and two lockwashers (6). This frees the sensor mounting bracket (7).
4. Remove the locknut (8) and washer (9) from the end of each tensioner shaft (10).
5. Remove the bearings (11), the roller (12), the spacer (13), and the spacer (14) from each tensioner shaft. Remove the tensioner shafts (10) from the rear tube.

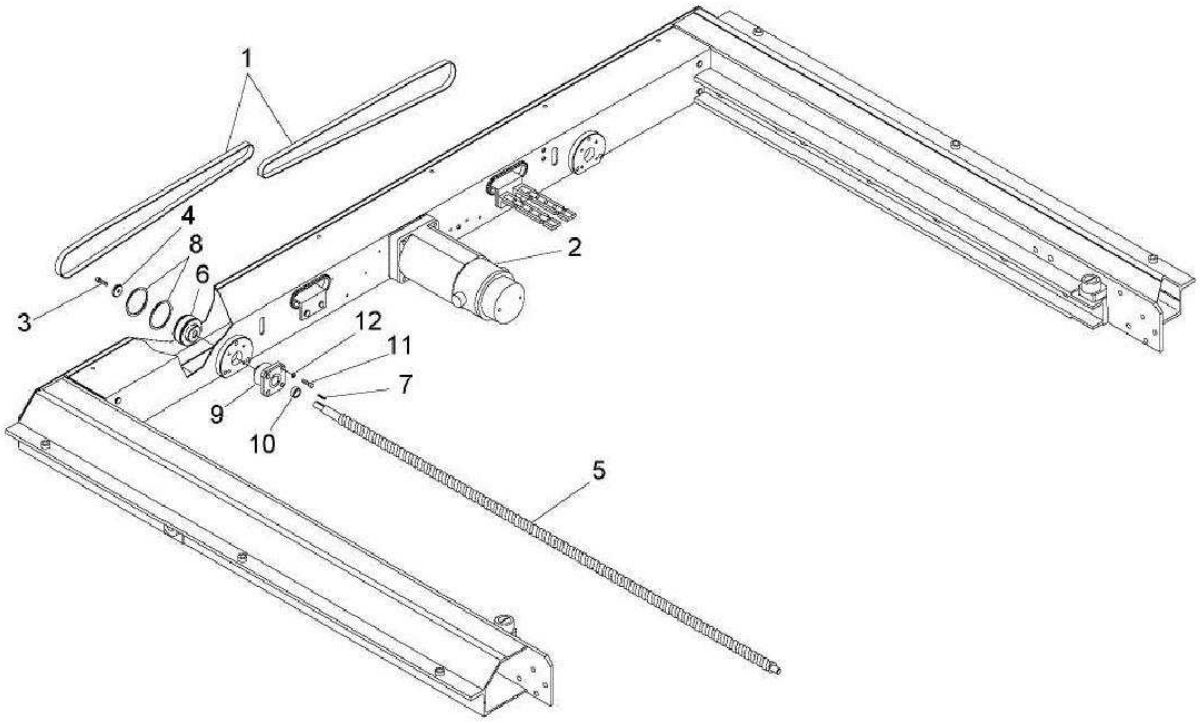

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Figure 4-2.82. Bridgeplate Ballscrew and Associated Parts

ITEM NO.	PART NAME	QTY	ITEM NO.	PART NAME	QTY
	Bridgeplate Assembly	Ref			
1	Drive Belt	2	7	Drive Key	2
2	Motor	Ref	8	Retaining Ring	4
3	Flat Head Screw	2	9	Bearing Unit	2
4	Washer	2	10	Spacer	2
5	Ballscrew	2	11	Cap Screw	8
6	Driven Pulley	2	12	Lockwasher	8

xvi) Remove Ballscrew

Refer to Figure 4-2.82. Bridgeplate Ballscrew and Associated Parts. Remove the drive belts, ballscrew, and bearings as described below.

1. Remove the drive belts (1) by working them from the drive pulley on the motor (2).
2. Remove the screw (3) and washer (4) from the end of each ballscrew (5).
3. Remove the driven pulley (6) from each ballscrew. Remove the drive key (7) from the end of each ballscrew.
4. Remove the retaining rings (8) from driven pulley.
5. Remove the ballscrews (5) from the bearing units (9). If the spacer (10) remains on the ballscrew, remove it from the ballscrew.
6. Remove and discard four screws (11) and four lockwashers (12) from each bearing unit (9). Pull the bearing units from the bearing mounting pads.
7. Remove the spacer (10) from the bearing unit.

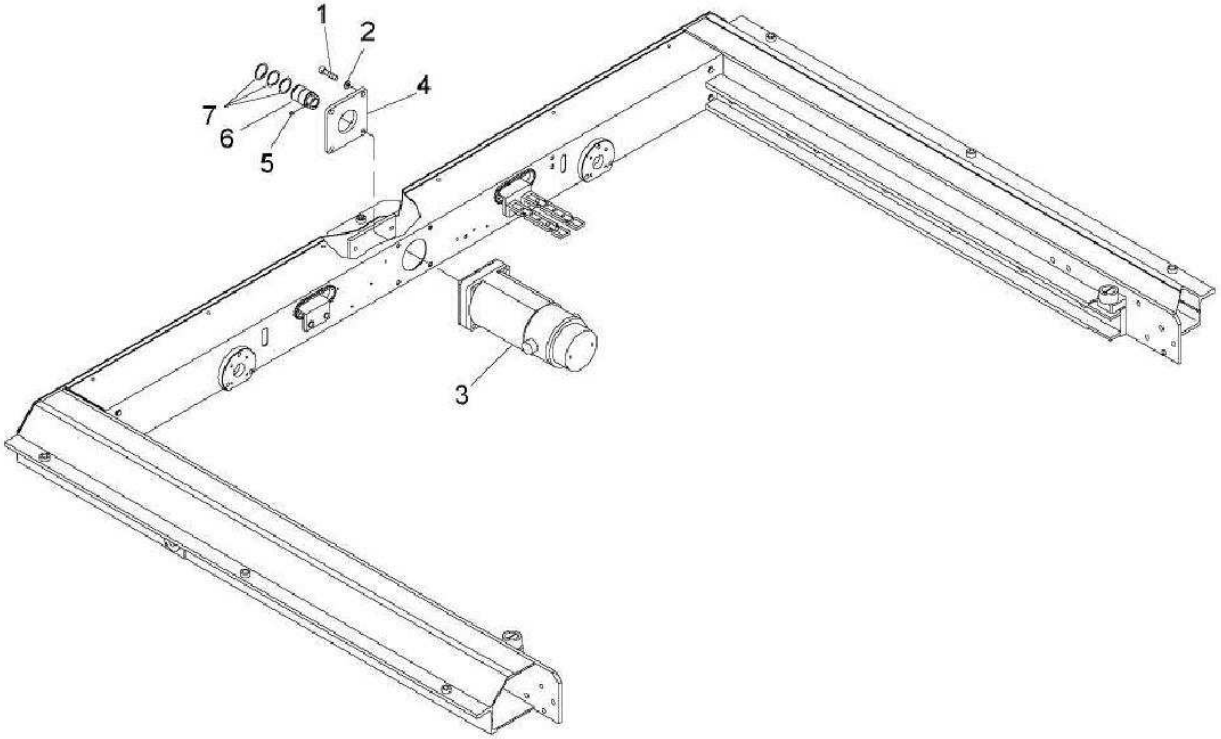

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Figure 4-2.83 Bridgeplate Motor and Associated Parts

ITEM NO.	PART NAME	QTY	ITEM NO.	PART NAME	QTY
	Bridgeplate Assembly	Ref			
1	Cap Screw	4	5	Locking Screw	2
2	Lockwasher	4	6	Drive Pulley	1
3	Bridgeplate Motor	1	7	Retaining Ring	3
4	Motor Mounting Plate	1			

xvii) Remove Bridgeplate Motor

Refer to Figure 4-2.83. Bridgeplate Motor and Associated Parts. Remove the bridgeplate motor and related components as described below.

1. Remove and discard four screws (1) and lockwashers (2) from the motor (3). Remove the motor mounting plate (4) and the motor.
2. Remove the locking screw (5) from the drive pulley (6). Pull the drive pulley from the end of the motor shaft.
3. Remove three retaining rings (7) from the drive pulley

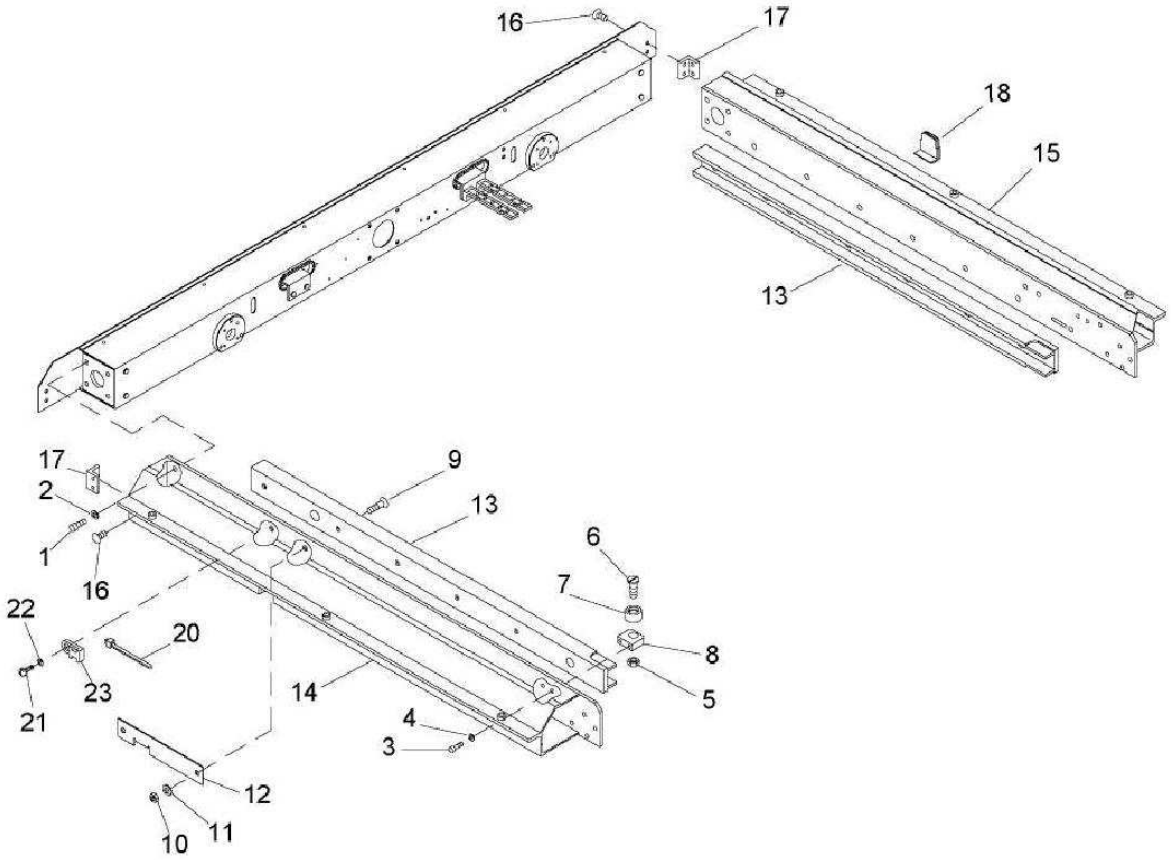


Figure 4-2.84 Bridgeplate Side Tube and Related Components

ITEM NO.	PART NAME	QTY	ITEM NO.	PART NAME	QTY
	Bridgeplate Assembly	Ref			
1	Cap Screw	8	13	Roller Channel	2
2	Lockwasher	8	14	Side Tube	1
3	Cap Screw	4	15	Side Tube	1
4	Lockwasher	4	16	Flat Head Screw	4
5	Locking Nut	2	17	Angle	2
6	Shoulder Screw	2	18	Fitting Bracket	1
7	Roller Bearing	2	19*	Adhesive (Anro Stud) Lock	AR
8	Guide Block	2	20	Harness Tie	1
9	Flat Head Screw	10	21	Screw	1
10	Hex Nut	10	22	Lockwasher	1
11	Lockwasher	10	23	Cable Tie Clip	1
12	Backing Plate	2			

*= item not illustrated

xviii) Remove Bridgeplate Side Tube

Refer to Figure 4-2.84 Bridgeplate Side Tube and Related Components. Remove and disassemble the side tubes and related components as described below.

1. Remove and discard the four screws (1) and lockwashers (2) securing each side tube and associated parts to the rear tube.
2. Remove and discard two screws (3) and two lockwashers (4), and remove the guide block (8) and components.
3. Remove and discard the locking nut (5) from the shoulder screw (6). This frees the roller bearing (7) from the guide block (8). Discard the shoulder screw and roller bearing.
4. Remove and discard five screws (9), nuts (10), and lockwashers (11). Separate the backing plate (12) and roller channel (13) from each side tube (14 and 15).
5. Remove and discard two screws (16) from each side tube, and separate the angle (17) from each side tube.
6. Remove the fitting bracket (18) from the side tube opposite the side tube that houses the wiring harness.
7. Cut and remove the harness tie (20).
8. Remove the screw (21), lockwasher (22), and cable tie clip (23).

NOTE: **Using a heat gun to soften the adhesive bonding that will make it easier for removal.**

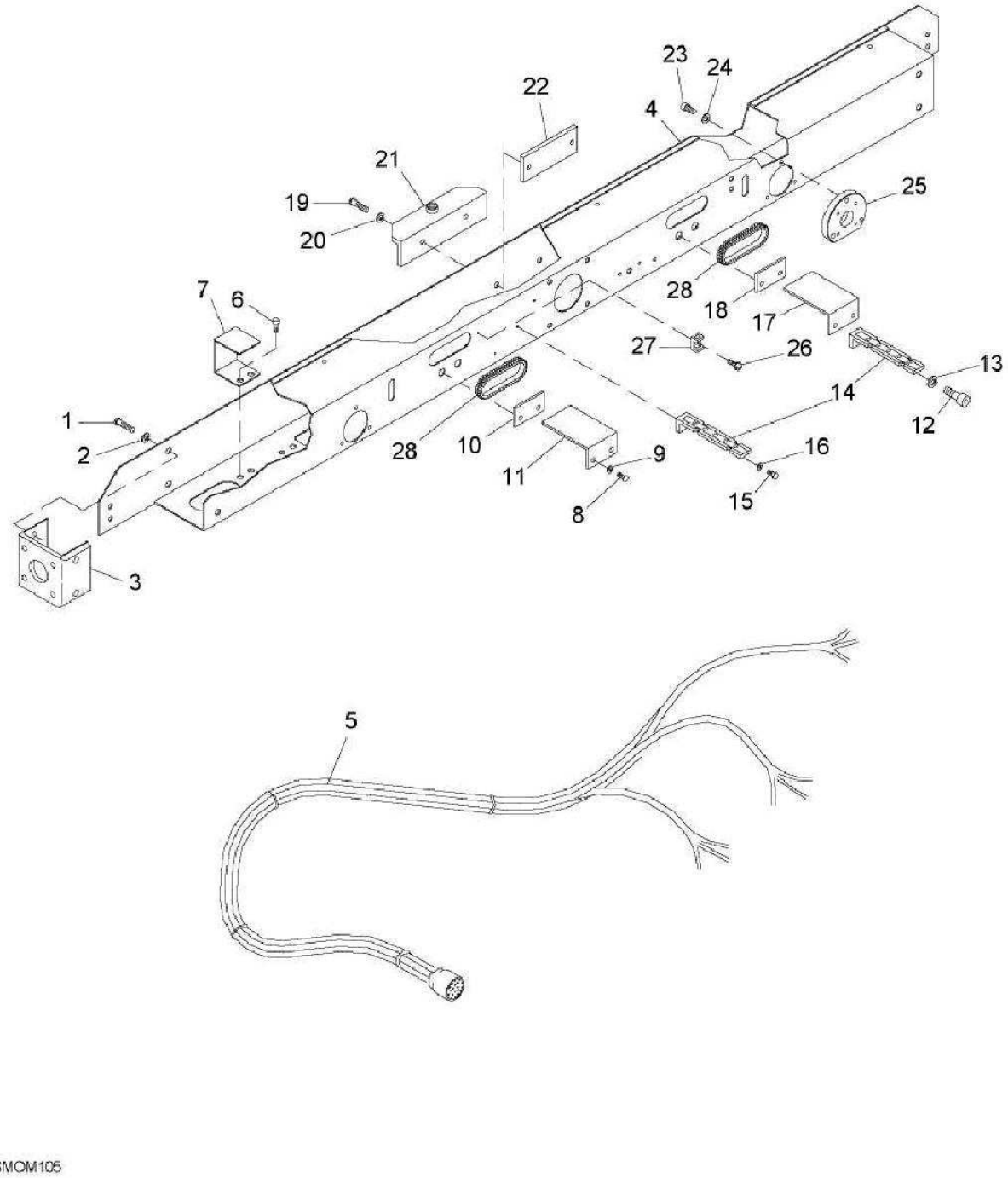


Figure 4-2.85 Bridgeplate Rear Tube and Related Components

ITEM NO.	PART NAME	QTY	ITEM NO.	PART NAME	QTY
	Bridgeplate Assembly	Ref			
1	Button Head Screw	8	16	Lockwasher	1
2	Lockwasher	8	17	Wire Guide	1
3	Bracket	2	18	Spacer	1
4	Rear Tube	1	19	Button Head Screw	2
5	Bridgeplate Harness	1	20	Lockwasher	2
6	Locking Screw	8	21	Rear Angle	1
7	Cable Guide	4	22	Tapping Plate	1
8	Button Head Screw	4	23	Hex Cap Screw	6
9	Lockwasher	4	24	Lockwasher	6
10	Spacer	2	25	Mounting Pad	2
11	Wire Guide	2	26	Sem Screw	2
12	Button Head Screw	6	27	Tie Mount	2
13	Lockwasher	6	28	Grommet	2
14	Cable Pole	3	29*	Threaded Rivet	8
15	Button Head Screw	1	30*	Threaded Rivet	4

*= item not illustrated

xix) Remove Rear Tube

Refer to Figure 4-2.85 .Bridgeplate Rear Tube and Related Components. Complete the disassembly of the rear tube as described below.

1. Remove and discard four screws (1) and lockwashers (2) to separate each bracket (3) from the rear tube (4).
2. Remove the bridgeplate harness (5) from the rear tube (4).
3. Remove and discard eight screws (6), and remove four cable guides (7).
4. Remove two screws (8) and lockwashers (9), and remove the wire guide (11) and spacer (10).
5. Remove and discard two screws (12) and lockwashers (13), and one screw (15) and washer (16). Remove three cable poles (14), the wire guide (17), and the spacer (18).
6. Remove and discard two screws (19) and lockwashers (20). This frees the rear angle (21) and the tapping plate (22).

7. Remove and discard three screws (23) and lockwashers (24) from each bearing mounting pad (25). This separates the bearing mounting pads from the rear tube.
8. Remove two Sem screws (26) and two tie mounts (27) from the rear tube.
9. Remove the grommets (28).
10. Remove and discard the threaded rivets (29 and 30) from the rear tube as described below

CAUTION: DRILL THE HEAD OF THE THREADED RIVET CAREFULLY TO AVOID DAMAGING THE REAR TUBE. DO NOT DRILL DEEP ENOUGH TO CONTACT THE REAR TUBE. DO NOT USE HIGH FORCE LEVELS TO PRESS THE RIVET BODY FROM THE TUBE

a. Place the rear tube in a drill press. Using a standard 7/16-inch drill bit, drill the head of the rivet to a thin shell. Do not drill deep enough to contact the rear tube.

b. Carefully peel the head of the rivet away from the tube. Press the body of the rivet downward and out of the rear tube. Do not use force levels that will distort or otherwise damage the rear tube.

4-2.2.e Cleaning/Painting

a) Cleaning

- **Reference Information.**
  1. Tools / Equipment.
     – MBTA approved Cleaning Tools / Equipment (commercial).
  2. Material.
     – MBTA approved Cleaning Products (commercial) (Refer to Section 1 Table 1-9).
- **Procedure.**

  To Clean each Bridgeplate proceed as follows:

  Set the Vehicle in safety condition in accordance with MBTA Carhouse Regulations.

  – Switch OFF the Battery Circuit Breaker (CB 3Q03 – Battery Box).

CAUTION: DO NOT USE SOLVENTS TO CLEAN NON-METALLIC PARTS. SOLVENTS CAN ATTACK NON-METALLIC PARTS, CAUSING THEM TO DETERIORATE AND LOOSE SERVICE LIFE.

NOTE: **Cleaning the bridgeplate components requires gaining access to the bridgeplate components. Access is available from above or below the bridgeplate. Specific access instructions are provided in Procedure A and B.**

Clean the external and internal bridgeplate door surfaces with a solvent moistened, lint-free cloth. Clean the rollers with a clean, dry, lint-free cloth.

Refer to procedure C. Clean the bridgeplate ramp with a detergent and water solution and a stiff-bristled brush. Dry the ramp surface with a dry, lint-free cloth.

Clean the bridgeplate top cover with clean, lint-free cloths moistened with a non-flammable solvent.

Clean the bridgeplate bottom cover with clean, lint-free cloths moistened with a non flammable solvent.

Clean the bridgeplate frame components with clean, lint-free cloths moistened with a non-flammable solvent. Clean carefully. Do not allow solvent to contact the gasket material that seals between the top and bottom covers and the frame members.

Where practical, clean the surfaces of the wiring harness and the switches, solenoids, resistor, and connected electrical components with a dry, lint-free cloth. If necessary, clean confined areas with a soft bristled brush and a vacuum cleaner.

If there is moisture in the bridgeplate interior dry it with clean, lint-free cloths and clean out the drain holes in the bottom cover.

Clean the surface of the bridgeplate motor with a lint free cloth.

The ballscrew must be cleaned and greased annually according to procedure D. During the 3 month cleaning periods check the ballscrew for contamination. If necessary, clean and grease it as described in Procedure D.

Clean the bellows with a soft bristled bush and a vacuum cleaner.

Clean the mechanical component surfaces with a solvent moistened, lint-free cloth.

Clean the rollers with a clean, dry, lint-free cloth.

A. BRIDGEPLATE ACCESS FOR CLEANING - TOP

The bridgeplate components accessible from the top are limited to the motor, the ballscrew, some areas of the wiring harness, the resistor, and the cable poles.

- **Procedure.**

  Set the Vehicle in safety condition in accordance with MBTA Carhouse Regulations.

  – Switch OFF the Battery Circuit Breaker (CB 3Q03 – Battery Box).

  Remove the floor plate above the bridgeplate.

  Remove the bridgeplate top cover by disengaging the self-clinch studs. Lint off the top cover.

  To gain access to the bridgeplate components, provide power and deploy the bridgeplate.

WARNING:	**TO AVOID ELECTRICAL SHOCK AND INJURY THAT CAN BE CAUSED BY MECHANICAL MOVEMENT OF THE DOOR SYSTEM COMPONENTS, REMOVE ELECTRICAL POWER FROM THE POWERED DOOR SYSTEM COMPONENTS DURING THE MAINTENANCE PROCEDURE BY DISCONNECTING CIRCUIT BREAKER.**

  Remove power from the bridgeplate before cleaning bridgeplate components by disconnecting circuit breaker.

  Clean the bridgeplate components.

NOTE:	**IF IT IS NECESSARY TO CLEAN AND LUBRICATE THE BALLSCREW REFER TO PROCEDURE D**

  After cleaning has been completed provide power to the bridgeplate and retract it, or stow it manually.

  Replace the top cover and install fasteners.

  Replace the car floor.

B. BRIDGEPLATE ACCESS FOR CLEANING, BOTTOM

All bridgeplate components are accessible from the bottom. If the cleaning is to be done from the bottom access, the car must be in a maintenance bay that has an access pit.

- **Procedure.**

  Set the Vehicle in safety condition in accordance with MBTA Carhouse Regulations.

  – Switch OFF the Battery Circuit Breaker (CB 3Q03 – Battery Box).

  Place the car in a maintenance bay with an access pit. Working from the pit, disengage the captive screws from the inboard section of the hinged bottom cover. Swing the cover down for the access to the bridgeplate components.

WARNING:	**TO AVOID ELECTRICAL SHOCK AND INJURY THAT CAN BE CAUSED BY MECHANICAL MOVEMENT OF THE DOOR SYSTEM COMPONENTS, REMOVE ELECTRICAL POWER FROM THE POWERED DOOR SYSTEM COMPONENTS DURING THE CLEANING PROCEDURE BY DISCONNECTING CIRCUIT BREAKER.**

  Provide power to the bridgeplate and deploy the ramp.

  Remove power from the bridgeplate before cleaning the bridgeplate components by disconnecting circuit breaker.

  Clean the bridgeplate components. If necessary, remove the screws from the outboard section of the hinged bottom cover and remove the entire cover.

  NOTE: IF IT IS NECESSARY TO CLEAN AND LUBRICATE THE BALLSCREW REFER TO PROCEDURE D

  Provide power to the bridgeplate and retract the bridgeplate ramp. The bridgeplate can also be stowed manually.

  Replace the bottom cover and install the screws. Tighten the screws

C. CLEANING THE BRIDGEPLATE RAMP

- **Procedure.**

Set the Vehicle in safety condition in accordance with MBTA Carhouse Regulations.

– Switch OFF the Battery Circuit Breaker (CB 3Q03 – Battery Box).

Deploy the bridgeplate ramp.

WARNING: TO AVOID ELECTRICAL SHOCK AND INJURY THAT CAN BE CAUSED BY MECHANICAL MOVEMENT OF THE DOOR SYSTEM COMPONENTS, REMOVE ELECTRICAL POWER FROM THE POWERED DOOR SYSTEM COMPONENTS DURING THE CLEANING PROCEDURE BY DISCONNECTING CIRCUIT BREAKER.

Remove power from the bridgeplate before cleaning the bridgeplate components by disconnecting circuit breaker.

Clean the bridgeplate ramp using a detergent and water solution and a stiff-bristled brush.

Dry the bridgeplate ramp with lint-free cloths.

Retract the bridgeplate ramp.

D. CLEANING AND LUBRICATION OF THE BALLSCREWS

- **Procedure.**

Set the Vehicle in safety condition in accordance with MBTA Carhouse Regulations.

– Switch OFF the Battery Circuit Breaker (CB 3Q03 – Battery Box).

Gain access to the bridgeplate ballscrews according to procedure B.

Deploy the bridgeplate and remove power from the bridgeplate.

Clean the exposed threaded area on each ballscrew using a clean, lint-free cloth moistened with a non-flammable solvent that is compatible with the lubricant. Make sure the threads are completely cleaned of lubricant and any contaminants.

CAUTION: DO NOT USE ANY DRY LUBRICANTS ON THE BALLSCREWS. USE A LIGHTWEIGHT LITHIUM BASED LUBRICANT.

Lubricate the ballscrews with a light coating of a lightweight lithium based grease. Use 2 to 5 cubic centimeters of grease. Spread the grease evenly over the entire exposed screw thread.

NOTE: DO NOT OVER-LUBRICATE THE BALLSCREW. THE BALLSCREW REQUIRES ONLY LIGHT LUBRICATION TO PROVIDE SMOOTH OPERATION AND TO PROTECT IT FROM WEAR.

Restore power to the bridgeplate and drive it to the stowed position. Remove the power from the bridgeplate.

Cut and remove the harness ties at the outboard end of each bellows. Push the bellows inboard to expose the end of the ballscrew that was not exposed with the bridgeplate deployed.

Clean the exposed threaded area on each ballscrew using a clean, lint-free cloth moistened with a non-flammable solvent that is compatible with the lubricant to be used on the ballscrew. Make sure the threads are completely cleaned of lubricant and any contaminants.

Complete the lubrication of the ballscrews with a light coating of a light weight lithium based grease. Spread the grease evenly over the entire exposed screw thread.

Reposition the bellows over the front bellows brackets and secure them with harness ties.

Install the bottom cover as described in procedure B.

b) Painting (Not Applicable)

4-2.2.f Inspection

- **Reference Information.**
  1. Tools / Equipment.
     – MBTA Carhouse Standard Tools Kit.
  2. Material (Not Applicable).
- **Procedure.**

  To Inspect the Bridgeplate proceed as follows:

  Set the Vehicle in safety condition in accordance with MBTA Carhouse Regulations.

  – Switch OFF the Battery Circuit Breaker (CB 3Q03 – Battery Box).

  Inspect the components for damage or deterioration.

  Inspect bridgeplate nose surface for excessive wear, replace as necessary.

  Inspect bridgeplate ramp traction surface for excessive wear. If the ramp traction surface no longer provides good traction, replace as necessary.

  Mechanical damage is defined as:

  – Corrosion
  – Erosion
  – Deformation
  – Cracking and Chipping
  – Wear
  – Overheating, as indicated by heat discoloration.

  Electrical damage and deterioration is defined as:

  – Overheat damage, as evidenced by discolored insulation on wiring, discolored electronic components, discolored conformal coating on the printed circuit boards, and discolored or blistered paint on components such as motors and solenoids;
  – Arcing damage, as evidenced by blackening and charring at electrical connections, and as blackened, charred areas on insulation;
  – Deterioration, as evidenced by cracks in insulation, brittle insulation, cracks or chips in electronic components or leads.

Dimensional inspection means measurement of a part to determine its suitability for continued service.

Electrical inspection is defined as those electrical checks conducted to verify of electrical components and their suitability for continued service.

Functional test is defined as test procedures verifying functionally of components and their capability to continue to meet service requirements.

4-2.2.g Repair (Not Applicable)

4-2.2.h Reassembly

- **Reference Information.**
  1. Tools/Equipment.
     – MBTA Overhaul Standard Tools Kit.
  2. Material (Not Applicable).
- **Procedure**

a) Reassembly of Bridgeplate

Reassemble the bridgeplate as shown in Figure 4-2.67 through Figure 4-2.85 Tighten all threaded fasteners to the torque value specified in the assembly step.

i) Reassemble Rear Tube

Refer to Figure 4-2.85. Bridgeplate Rear Tube and Related Components. Reassemble the bridgeplate rear tube as described below.

1. Use a Rivnut tool to install new threaded rivets (29 and 30).
2. Install the grommet (28).
3. Install two tie mounts (27) on the rear tube using two Sem screws (26). Tighten the screws to 13 ± 1 inch pounds.
4. Install each mounting pad (25) on the rear tube using three lockwashers (24) and three screws (23). Tighten the screws to 5 ± 1 foot pounds.
5. Attach the rear angle (21) and tapping plate (22) using two lockwashers (20) and two screws (19). Tighten the screws to 11 ± 1 inch pounds.
6. Install one wire guide (17), two spacers (18), and three cable poles (14) using two screws (12) and lockwashers (13), and one screw (15) and lockwasher (16). Tighten the screws to 23 ± 1 inch pounds.
7. Install the wire guide (11) and spacer (10) with two lockwashers (9) and screws (8). Tighten the screws to 23 ± 1 inch pounds.
8. Install four cable guides (7) using eight locking screws (6). Tighten the screws.

NOTE **One cable guide is installed inside the rear tube on either side of the angle plate location. The other two cable guides are installed inside the rear tube in either the right-hand or left-hand locations, as determined by the side of entry of the bridgeplate wiring harness**

9. Position the bridgeplate harness (5) in the rear tube (4), routing the harness behind the cable guides, and through the appropriate wiring exits.
10. Install each rear tube end bracket (3). On the wiring harness end, route the wiring harness through the O-cutout in the bracket, making sure that the wiring harness is neither kinked nor pinched.
11. Secure each rear tube end bracket with four lockwashers (2) and four buttonhead screws (1). Tighten the screws to 11 ± 1 foot pounds.

ii) Reassemble Side Tube

Refer to Figure 4-2.84. Bridgeplate Side Tube and Related Components, and Figure 4-2.85. Bridgeplate Rear Tube and Related Components. Assemble and attach the side tubes to the rear tube assembly as described below.

1. Install the cable tie clamp (23), and secure it with one lockwasher (22) and screw (21).
2. Install the fitting bracket (18). Put a thin coating of stud locking adhesive (19) on the threads of screws (16). Install the angle (17) on each side tube (14 and 15) using two screws (16). Tighten the screws to 6 ± 1 foot pounds.

NOTE: **The stud locking adhesive is an air cure adhesive.**

Traction surface (Vapor P/N 59621488) utilizes 3M® Safety-Walk components and adhesives. Refer to manufacturer instructions for adhesive applications and procedures & Use of Adhesive is evident during reassembly.

3. Attach the roller channel (13) and backing plate (12) using five lockwashers (11), flat head screws (9), and hex nuts (10). Tighten the screws to 20 ± 2 foot pounds.
4. Mount a new roller bearing (7) on each guide block (8) using a shoulder screw (6) and locking nut (5). Tighten the screw and nut to 27 ± 2 foot pounds.
5. Attach the guide block (8) and components using two lockwashers (4) and two screws (3). Tighten the screws to 7 ± 1 foot pounds.
6. Feed the bridgeplate wiring harness (5, Figure 4-2.85) into its side tube.

7. Mount each side tube to the rear tube using four lockwashers (2, Figure 4-2.84) and four cap screws (1). Tighten the cap screws to 13 ± 1 foot pounds.
8. Position the bridgeplate wiring harness (5, Figure 4-2.68) and secure it with one harness tie (20, Figure 4-2.67).

iii) Reassemble Bridgeplate Motor and Associated Parts

Refer to Figure 4-2.83. Bridgeplate Motor and Associated Parts. Install the bridgeplate motor and related components as described below.

1. Install 3 retaining rings (7) on the drive pulley (6).
2. Mount the drive pulley on the motor shaft using locking screws (5), as described below.
   - **Install the drive pulley with the locking screws (5) aligned with the flat on the motor shaft.**
   - **Turn the screws in until they contact the flat on the motor shaft. Twist the pulley slightly back and forth and turn the screws in until the pulley will not twist in relation to the motor shaft. Tighten the screws.**
3. Position the motor (3) and motor mounting plate (4) at the rear tube assembly. Install four lockwashers (2) and four cap screws (1). Tighten the cap screws to 7 ± 1 foot pounds.

iv) Reassemble Ballscrew and Associated Parts

Refer to Figure 4-2.82 Bridgeplate Ballscrew and Associated Parts. Install the bearings and ballscrews as described below.

1. Place the spacer (10) over the end of the ballscrew (5).
2. Install two bearing units (9) in the bearing pads on the rear tube assembly. Secure each with four lockwashers (12) and four cap screws (11). Tighten the screws to 7 ± 1 foot pounds.
3. Install the ballscrews (5) through the bearing units.
4. Place two retaining rings (8) on each driven pulley (6).
5. Place a drive key (7) in the keyway on each ballscrew.
6. Place the right-hand driven pulley on the right-hand ballscrew with the long hub inward. Install the washer (4) and the flat head screw (3) into the end of the ballscrew. Tighten the screw to 22 ± 1 inch pounds.
7. Place the left-hand driven pulley on the left-hand ballscrew with the long hub outward. Install the washer (4) and the flat head screw (3) into the end of the ballscrew. Tighten the screw to 22 ± 1 inch pounds.

NOTE: The drive belts (1) will be installed after the support plate and carriage plate assemblies are installed in section 4-2.2.h a) xi

8. Lubricate the ballscrews with a light coating of a lithium based grease. Do not over grease.

v) Reassemble Rear Tube

Refer to Figure 4-2.81. Bridgeplate Rear Tube Mounted Parts. Install the belt tensioners, the 50 watt resistor, and the proximity sensor as described below.

1. Place the tensioner shafts (10) through the slots into the rear tube assembly.
2. Place one spacer (14) and one bearing (11) over each shaft.
3. Place the roller (12) over the spacer (13), and place the second bearing (11) into the rear bearing recess in the roller. Place these parts on the tensioner shaft, making sure the first bearing (11) is seated in the front bearing recess in the roller.
4. Install one washer (9) and one locknut (8) on each tensioner shaft. Tighten the locknut finger tight. The locknuts will be tightened after the drive belts are installed in section 4-2.2.h a) x.
5. Install the sensor mounting bracket (7) on the rear tube, securing it with two lockwashers (6) and two cap screws (5). Tighten the screws to 7 ± 1 foot pounds.
6. Install the 50 watt resistor (4) with two Sem screws (3). Tighten the screws to 7 ± 1 inch pounds.

NOTE: The resistor must be soldered into the electrical system. This is done as part of the assembly section step 4-2.2.h a) xv

7. Place the proximity sensor (2) through the sensor mounting bracket. Install the locknut (1) onto the end of the sensor finger tight.

NOTE: The position of the proximity sensor will be adjusted and the locknut tightened after the support plate and carriage plates have been installed in step 4-2.2.h a) xi

vi) Reassemble Coiled Cord Harness

Refer to Figure 4-2.80 Bridgeplate Coiled Cord Harness and Associated Parts. Install the coiled cord harness as described below.

1. Attach the rear cable spool (16) to the rear tube assembly with two screws (12), plain washers (15), lockwashers (14), and hex nuts (13). Tighten the screws and nuts to 13 ± 1 inch pounds.
2. Attach the front cable spool (6) to the cable bracket (7) with two screws (8), plain washers (10), lockwashers (11), and hex nuts (9). Tighten the screws and nuts to 10 ± 1 inch pounds.
3. Install the support rod (2) into the rear cable spool. Install the lockwasher (4) and the hex nut (3) onto the end of the support rod. Hold the support rod with vise grips and tighten the hex nut to 6 ± 1 foot pounds.
4. Install the coiled cord harness (5) over the support rod and rear cable spool. Install the front cable spool and cable bracket over the support rod, placing the cable support diameter into the coiled cable.

NOTE:	**The cable will be secured and connected to the wiring harnesses in the electrical connection step of this assembly section.**

vii) Reassemble Carriage Side Plate

Refer to Figure 4-2.79. Bridgeplate Carriage Side Plate Components. Assemble the carriage side plates and related components as described below.

1. Place a cam spacer (21) on each cam follower bearing (18). Place the cam bearings through the carriage side plate (22) and install the lockwasher (20) and jam nut (19). Hold the cam bearing with an Allen wrench and tighten the jam nut to 54 ± 2 foot pounds.
2. If the lock pin bushing (17) was removed from the guide bar (7) install it as follows.
    a. Align the slot in the bushing with the lock plate slot in the guide bar and use an arbor press to press the bushing into the guide bar. The bushing must be flush with the surface of the guide bar.
    b. Ream the bushing ID to 0.629 to 0.630 inch.
    c. Make sure there are no burrs on the bushing and that the bushing and guide bar are free of machining debris.
3. Position the lock pin (15) on the lock plate (16), aligning the pin hole in the plate and pin. Press in the pin (14) so that it is flush with to below the surface of lock pin (15). Make sure the lock pin pivots freely on the lock plate.

4. Place the bushing (13) in the lock plate.
5. Position the assembled lock plate in the guide bar with a thrust washer (12) on each side of the lock plate. Press the lock pin (11) through the guide bar (7), lock plate, and thrust washers. Secure the lock pin (11) with the retaining ring (10).
6. Position two roller bearings (9) in the guide bar (7). Press in two dowel pins (8). The dowel pins must be flush with to below each surface of the guide bar.
7. Position the assembled guide bar to the carriage side plate. Install two lockwashers (6) and two cap screws (5). Tighten the screws to 7 ± 1 foot pounds.
8. Position the assembled carriage side plates to the carriage plates (3 and 4) and secure them with four lockwashers (2) and four cap screws (1). Tighten the cap screws to 11 ± 1 foot pounds.

viii) Reassemble Solenoid and Switches to Carriage Plate

Refer to Figure 4-2.78. Bridgeplate Solenoid and Lever Switch Components, and Figure 4-2.79 Bridgeplate Carriage Side Plate Components. Assemble the solenoids, switches, and related components to the carriage plates as described below.

1. Assemble the switch insulator (21, Figure 4-2.78) and the lever switch (20) on the switch support (24). Install the plain washers (19), the lockwashers (18), and the screws (17). Tighten the nuts to 10 ± 1 inch pounds.
2. Place the assembled switch supports and switches on the carriage plates. Install two lockwashers (23) and two screws (22). Tighten the screws to 23 ± 2 inch pounds.
3. Mount the solenoid (12) to the solenoid bracket (16) using four screws (13) and backing plates (14). Tighten the screws to 10 ± 1 inch pounds.
4. Position the link (7) and the solenoid (12), and install the link pin (11) and retaining ring (10).
5. Position the solenoids and brackets to the carriage plates and attach them with two lockwashers (9) and two cap screws (8). Tighten the cap screws to 60 ± 3 inch pounds.
6. Position the link (7) to the lock plate (16, Figure 4-2.79), aligning the pin bores. Install the link pin and secure it with the retaining ring (5).
7. Attach a spring bracket (2) to each carriage plate with two lockwashers (4) and two cap screws (3). Tighten the cap screws to 60 ± 3 inch pounds.
8. Attach one end of the spring (1) to the lock plate (16, Figure 4-2.79). Attach the other end of the spring to the spring bracket (2, Figure 4-2.78).

ix) Reassemble Clevis and Link Components

Refer to Figure 4-2.77. Bridgeplate Clevis and Link Components. Assemble and mount the clevises and links as described below.

1. Position the bushing (12) in the link (3).
2. Align the link and thrust washer (10) in each clevis (1 and 2).
3. Insert the link pin (9) through the clevis and link. Install the hardened washer (11) over the end of the link pin and install the cam follower bearing (8). Tighten the cam bearing and the setscrew (7).
4. Place the bushing (6) in the link.
5. Align the link and thrust washer (5) with the carriage side plate and install the shoulder screw (4). Tighten the shoulder screw to 54 ± 2 foot pounds.

x) Reassemble Ballnut Components

Refer to Figure 4-2.76. Bridgeplate Ballnut Components. Assemble the ballnut and associated parts and as described below.

CAUTION: DO NOT REMOVE THE BALLNUT FROM THE TUBE. IF THE BALLNUT IS REMOVED, THE BEARING BALLS WILL FALL OUT, WHICH CAN RESULT IN THE BALLNUT BEING SCRAPPED

1. Screw the ballnut (11) into the nut housing (7).
2. Attach the bellows bracket (1) to the nut housing.
3. Place an insulating washer (10) on each trunnion arm of the nut housing. Place a nylon bearing (9) on each trunnion arm. Secure them with retaining rings (8).
4. Place the yoke (5) and yoke retainer (6) over the nut housing. Install two lockwashers (4) and two cap screws (3), and two lockwashers (4) and two cap screws (2). Tighten the screws to 25 ± 2 inch pounds.
5. Place a tie wrap through the assembly tool tube and secure it around the assembled components on the side opposite the yoke. This will facilitate the initial installation in paragraph 4-2.2.h a) xi, and prevent the ball bearings from being lost from the ballnut.

xi) Reassemble Support and Carriage Plates

Refer to Figure 4-2.75. Bridgeplate Support and Carriage Plates. Assemble the support plate and carriage plates subassembly as described below.

For graphical illustrations of ballnut mounting and belt, use of force guage for belt installa tion refer Figure 4-2.76.

1. Install the two wear pads (12) on the support plate (3) using four screws (11). Tighten the screws securely, but do not distort the wear pads.
2. Align the carriage plates (4 and 5) with the support plate and install six lockwashers (10) and six screws (9) through each carriage plate. Tighten the screws to 20 ± 1 foot pounds.
3. Install one carriage bushing (8) into each carriage plate.

NOTE: The assembly step below must be done with the bridgeplate framework and the carriage and support plate assembly inverted

4. With the bridgeplate framework and the carriage and support plate assembly inverted, place the yoke on the assembled ballnuts into the carriage bushings.

NOTE: The following step requires at least two people to feed the ballnuts onto the ballscrews and the cam bearings into the roller channels

5. Position the assembled support and carriage plates at the open end of the bridgeplate framework. Cut and remove the harness ties that keep the assembly tube in place in the ballnut.
6. Move the support and carriage plate assemblies into the framework while feeding the cam bearings into the roller channels and the assembly tubes onto the ends of the ballscrews.
7. Continue to move the support and carriage plates into the framework, sliding the ballnuts off the assembly tubes and onto the ballscrews. Move the support and carriage plates assembly completely into the framework. The lock pins must engage the roller guides.
8. Place a bellows (2) over each ballscrew and onto the rear bellows bracket. Secure the bellows in place using a harness tie (1) at each bellows bracket.
9. Install the drive belts as described below.
    a. Put the bridgeplate in the retracted and locked position, but with the bridgeplate loaded toward the deployed direction.
    b. Place the inner belt over the inside drive pulley and over the inner driven pulley.
    c. Place the outer belt over the outer driven pulley on the remaining screw. Pull the belt to the drive pulley on the motor shaft, aligning a cog on the belt with a notch in the drove pulley about 30 degrees past top dead center. Keep the cog and notch engaged,

and turn the drive screw that has already been belted counterclockwise, to move the support plate to the rear. This will rotate the drive pulley counterclockwise and feed the outer belt onto the drive pulley in the correctly timed position.

d. Return the bridgeplate to the stowed-forward loaded position.

e. Refer to section 4-2.2.i a) ii for belt tension and adjustment.

f. Refer to section 4.22.6 for proximity switch adjustment.

xii) Reassemble Front Guide Blocks

Refer to Figure 4-2.74. Bridgeplate Front Guide Blocks. Install the front guide blocks as described below.

1. Install a cam follower bearing (5) into each guide block (3 and 4). Tighten the cam bearing.
2. Attach each guide block to its side tube using two lockwashers (2) and two cap screws (1). These cap screws are installed through the innermost screw holes in the side tube and into the guide blocks. The remaining cap screws will be installed with the tube cover bracket. Tighten the cap screws to 11 ± 1 foot pounds.

xiii) Reassemble Locking Lever Components

Refer to Figure 4-2.73. Bridgeplate Locking Lever Components. Assemble and install the locking lever and associated parts and the tube cover bracket as shown in and as described below.

1. Assemble a torsion spring (15) into each lever (12 and 13).
2. Place one thrust washer (14) over the shoulder screw (10) and place the lever and components over the shoulder screw.
3. Place the remaining thrust washer (14) over the shoulder screw and against the lever.
4. Install these components into the block (11). Tighten the shoulder screw until the levers and thrust washers have only enough clearance to allow them to move freely.

NOTE: The levers (12 and 13) must be free to move in relation to the block (11) after the shoulder screw (10) has been tightened

5. Tighten the set screw (9) to lock the shoulder screw securely at its adjusted position.

6. Install the assembled locking lever components into the side tubes. Secure each locking lever assembly using two lockwashers (8) and two cap screws (7). Tighten the cap screws to 23 ± 2 foot pounds.
7. Check the locking lever for engagement and for freedom of movement. Because the bridgeplate is in the retracted position, the locking lever must engage at installation. The locking lever must disengage freely when moved by hand, with no evidence of catching or binding.
8. Position the tube cover bracket (5 and 6) over the locking lever and install one lockwasher (4), one button head screw (3), one lockwasher (2), and one cap screw (1). The remaining screws and lockwashers will be installed when the front bar is installed in step 14. Tighten the screw (3) to 72 ± 3 inch pounds and the screw (1) to 11 ± 1 foot pounds.
9. Make sure the locking levers (12 and 13) are free to move in the tube cover bracket (5 and 6) slot.

xiv) Reassemble Front Bar Components

Refer to Figure 4-2.72. Bridgeplate Front Bar Components. Assemble and install the front bar and associated components as described below.

1. Insert new helical inserts (20, 21, 22, 23, and 24) as follows.
    a. Place the helical insert in the appropriate insertion tool. Use standard sho[p tools for these procedures.
    b. Place the tool against the front bar (5) at the tapped hole requiring the new helical insert. Use the tool to thread the insert into the tapped hole to 1/2 turn below the surface of the front bar.
    c. Use a pointed tool to break the drive tang from the helical insert. Make sure the drive tang is removed from the tapped hole.
2. Insert two bearings (19) into the front bar bearing bores. Make sure the bearings are seated completely in the bore. If it is necessary to press them into the bore press only on the outer race to avoid damaging the bearings.
3. Install the roller bracket (18) using plain washers (16), lockwashers (17), and button head screws (15). Tighten the screws to 72 ± 3 foot pounds.
4. Align the roller (14) in the roller bracket and insert the shoulder screw (12) through the bracket and roller. Install the plain washer (13) and lock nut (11). Tighten the locknut to 72 ± 3 inch pounds.
5. Install each front bellows bracket (1) with two lockwashers (10) and button head screws (9). Tighten the button head screws to 23 ± 1 inch pounds.
6. Attach each guide ramp (6 and 7) with two torque patch screws (8). Tighten the screws securely, but do not deform the guide ramps.

7. Attach the front bar (5) to the side tubes using two lockwashers (4) and two cap screws (3) in each end of the bar. Tighten the screws to 11 ± 1 foot pounds.
8. Fit the bellows over the bellows brackets (1) and secure them with harness ties (2).

xv) Reassemble Encoder Harness and Coiled Cord Harness

Refer to Figure 4-2.71. Bridgeplate Encoder Harness Assembly, and Figure 4-2.75. Bridgeplate Support and Carriage Plates. Install the encoder harness and connect the coiled cord harness as described below.

1. Connect the cable bracket (10, Figure 4-2.71 to the support plate (3, Figure 4-2.75) using two locking screws (9, Figure 4-2.71). Tighten the screws to 13 ± 1 inch pounds.
2. Route the wiring harness (1) as shown in Figure 4-2.71 and connect each knife connector according to the wire numbers and the procedure below.

   Place a heat shrink tube (2) on either of the two leads to be connected.

   Join the knife connectors and slide the heat shrink tubing over the joint.

   Using a heat gun, apply heat evenly to each connection until the tube shrinks and the internal adhesive is visible at the ends of the tubing.
3. Solder the two connections to the 50-watt resistor (11, Figure 4-2.71 Bridgeplate Encoder Harness Assembly) according to standard electrical shop practice.
4. Carefully position the wiring harness so that there is no stress on any wiring.
5. Attach the wiring harness using harness ties where the harness crosses the tie mounts. Connect to loop clamp (5) at four points (13) and to tie mounts (8) at nine points (12)
6. Place four loop clamps (5) around the harness and attach the clamps to the carriage plates using four plain washers (4) and four Sem screws (3). Connect to loop clamp (5) at four points (13) and to tie mounts (8) at nine points (12).

xvi) Install Bridgeplate Bottom Cover

Refer to Figure 4-2.70. Bridgeplate Bottom Cover. Install the bridgeplate bottom cover as described below.

NOTE:	**Do not install a drain clearing cotter pin in the drain hole immediately beneath the motor. There is not enough clearance with the motor for a cotter pin in that position**

1. If any of the cotter pins (10) installed to keep the drain holes clear of debris are missing, install them and bend the legs over so that the cotter pins will be loose in the drain holes.
2. Install gasket tape (11) around the periphery of the bridgeplate, over the holes for the button head screws (7) and captive screws (1). Make sure there are no gaps in the gasket coverage.
3. If any captive screws (1) have been removed from the bottom cover (9), install the screw with a lockwasher (2) through the bottom cover, and place a retainer (3) on the screw.
4. Position the bottom cover assembly on the bridgeplate. Install twelve lockwashers (8) and button head screws (7). Tighten the screws to 23 ± 2 inch pounds.
5. Install the captive screws (1), and tighten them to 23 ± 2 inch pounds.

xvii) Install Bridgeplate Ramp

Refer to Figure 4-2.69. Bridgeplate Ramp, and Figure 4-2.70. Bridgeplate Bottom Cover. Assemble and install the bridgeplate ramp as described below.

WARNING:	**THE BRIDGEPLATE WEIGHS APPROXIMATELY 270 POUNDS AND IS AWKWARD TO LIFT. TO AVOID INJURY, SEEK ASSISTANCE TO INVERT THE BRIDGEPLATE ASSEMBLY**

1. Make sure the support plate is completely in the retracted position and that both locking pins are engaged. Turn the bridgeplate assembly over by raising the front bar Figure 4-2.68 end of the bridgeplate, which is lighter than the rear tube end
2. Install two roller guides (7, Figure 4-2.69 using eight locking screws (6). Tighten the screws to 20 ± 1 inch pounds.
3. Install the plate nose (5) with nine locking screws (4). Tighten the screws to 72 ± 3 inch pounds.

WARNING:	**THE BRIDGEPLATE RAMP WEIGHS APPROXIMATELY 70 POUNDS WITH THE BRIDGEPLATE NOSE ASSEMBLED. IT IS HEAVY AND AWKWARD TO LIFT. TO AVOID INJURY, SEEK KELP IN LIFTING THESE PARTS AR USE SUITABLE LIFTING AIDS SUCH AS A SLING AND CHAINFALL**

4. With assistance, place the ramp (3) on the support plate. Install two locking screws (2) in each side of the ramp. Tighten the screws to 20 ± 1 foot pounds.
5. Position the traction surface (1) on the ramp and carefully stick it to the ramp surface.

NOTE: Traction surface (Vapor P/N 59621488) utilizes 3M® Safety-Walk components and adhesives. Refer to manufacturer instructions for adhesive applications and procedures.

xviii) Reassemble Front Cover

Refer to Figure 4-2.68. Bridgeplate Front Cover Assembly. Assemble and install the front cover assembly as shown below.

1. Align the rollers (9) in the roller supports and install the roller shafts (8). Place a retaining ring (7) on each end of the shafts.
2. Install two cover guides (6) using two locking screws (5). Tighten the screws to 72 ± 3 inch pounds.
3. Align the front cover (1) and four spacers (4) with the front bar. Attach the cover using 12 lockwashers (3) and 12 button head screws (2). Tighten the screws to 72 ± 3 inch pounds.
4. Make sure the front cover opens and closes without binding or catching, and that the rollers turn freely.

xix) Install Top Cover

Refer to Figure 4-2.67 Bridgeplate Top Cover Assembly. Install the top cover as described below.

NOTE: Before assembling top cover, test bridgeplate according to section 4-2.2.i b

1. Install gasket tape (4) around the periphery of the bridgeplate frame (5), covering the holes for the self-clinch studs (3) in the top cover (2).
2. Position the cover on the bridgeplate. Push the self-clinch studs (3) into the mating holes in the bridgeplate frame.
3. Install the fitting bracket (1).

b) Installation

Installation of Bridgeplate as follows

1. Place two 60-inch supports such as 2” x 4” lumber on the lift platform of a wheeled hydraulic lift. With assistance, place the bridgeplate on the lift so

the bridgeplate is supported on the side tubes. The rear tube must lead as the assembly is placed into the car.

2. Carefully raise the platform until the bridgeplate will just clear the mounting rails. Using the wheeled hoist, guide the bridgeplate into the car opening onto the mounting rails. Slide the bridgeplate into place.
3. Position the bridgeplate so that the mounting screw slots on the car mounting flanges and the screw holes in the bridgeplate mounting flanges are aligned.
4. Apply shims between car structure and bridgeplate frame as required to eliminate gaps.
5. Install seven screws, three in each side flange, and one in the rear flange. Do not tighten the screws at this time.
6. Remove the button head screws and lock washers securing the back section of the hinged bottom cover. Swing the bottom cover down.
7. Join the car wiring harness at the bridgeplate connector and make sure the connector is secured to the tie mount with a harness tie.
8. Slide the fitting bracket into the wiring cutout in the side tube, and position and tighten the liquid tight cable connector.
9. Restore electrical power to the door system and the bridgeplate.
10. Ensure that a platform is present. The platform can be replaced with a support with a convenient height, seven to eight inches above Top of Rail (TOR), placed at a proper distance. Deploy and retract the bridgeplate several times to verify smooth operation. Timing for the bridgeplate movement from a fully stowed position to a fully deployed position or from a fully deployed

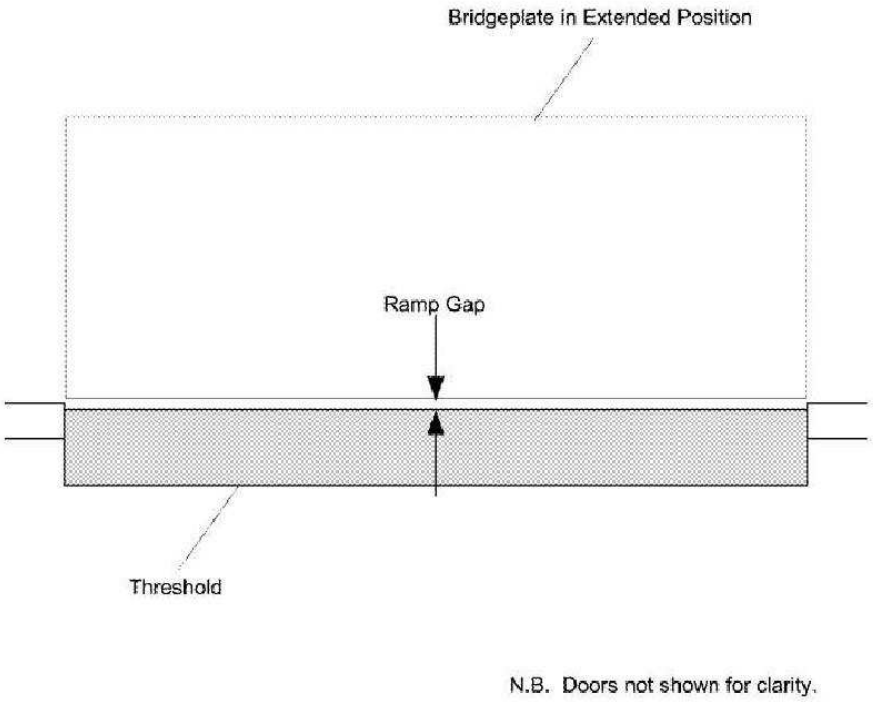
4-2.2.i Adjustment/test

a) Adjustment of bridgeplate

1. Verify and tighten all the mounting hardware on the bridgeplate elements: solenoid mounting screws, solenoid brackets mounting screws, lever switch mounting screws, link pins, retaining rings, and (“C” Clips).
2. Command the ramp to deploy (platform not required)
3. With the ramp fully deployed, raise the ramp until the back edge of the ramp makes contact with the outside edge of the threshold. In this position, the ramp should be in a horizontal position and square to the body of the car.
4. If the ramp is not horizontal, slide the bridgeplate frame outward, away from the centerline of the vehicle, until the deployed ramp can assume a horizontal position.

5. If the deployed ramp can be lifted up past horizontal position, slide the bridgeplate frame inward, towards the centerline of the vehicle, until the deployed ramp can be manually lifted only up to a horizontal position

6. With the deployed ramp lifted up to a horizontal position and with the back edge of the ramp touching the outside nose of the threshold, verify that the back edge of the ramp is contacting the threshold nose along its entire width. Adjust the angular position of the bridgeplate assembly with respect to the car as required to eliminate gaps.



RMM125

Figure 4-2.86. Ramp Gap

7. Leave the fully deploying ramp to rest on its own weight. Measure the gap between the back edge of the ramp and the edge of the threshold. The gap at the left corner, at the middle and at the right corner should be the same = 1 “ + 1/16, -1/8” (” (target value for adjustment 7/8”). Refer to Figure 4-2.86.

8. Upon completing adjustments, torque the bridgeplate mounting hardware to 6 ft-lb. (refer to carbuilder specifications) and apply new tabs.

9. Turn the bridgeplate motor OFF and with the ramp in the deployed position clean the roller channels using clean rag and chemical solvent.

10. Check and if needed, apply proper grease on the ball screws. Apply a generous coating of grease, lithium base (VRI P/N 67110044-03) to screw threads prior to assembly.

11. Actuate the manual unlock levers to release the ramp.

12. Manually place the ramp in a horizontal position. Measure the force required to manually stow the ramp using a force gauge. The force required to manually stow the ramp should not exceed 45 lbs.

13. Using the force gauge check the belt tension as show in section 4-2.2.i. If adjustment is required, follow the procedure in section 4-2.2.i

14. Using a feeler gauge check the proper gap on the lever switches. Insert a 0.062” thick feeler gauge between the switch lever and lock lever at the point of the contact. If adjustment is required, follow procedures in section 4-2.2.i) iv.

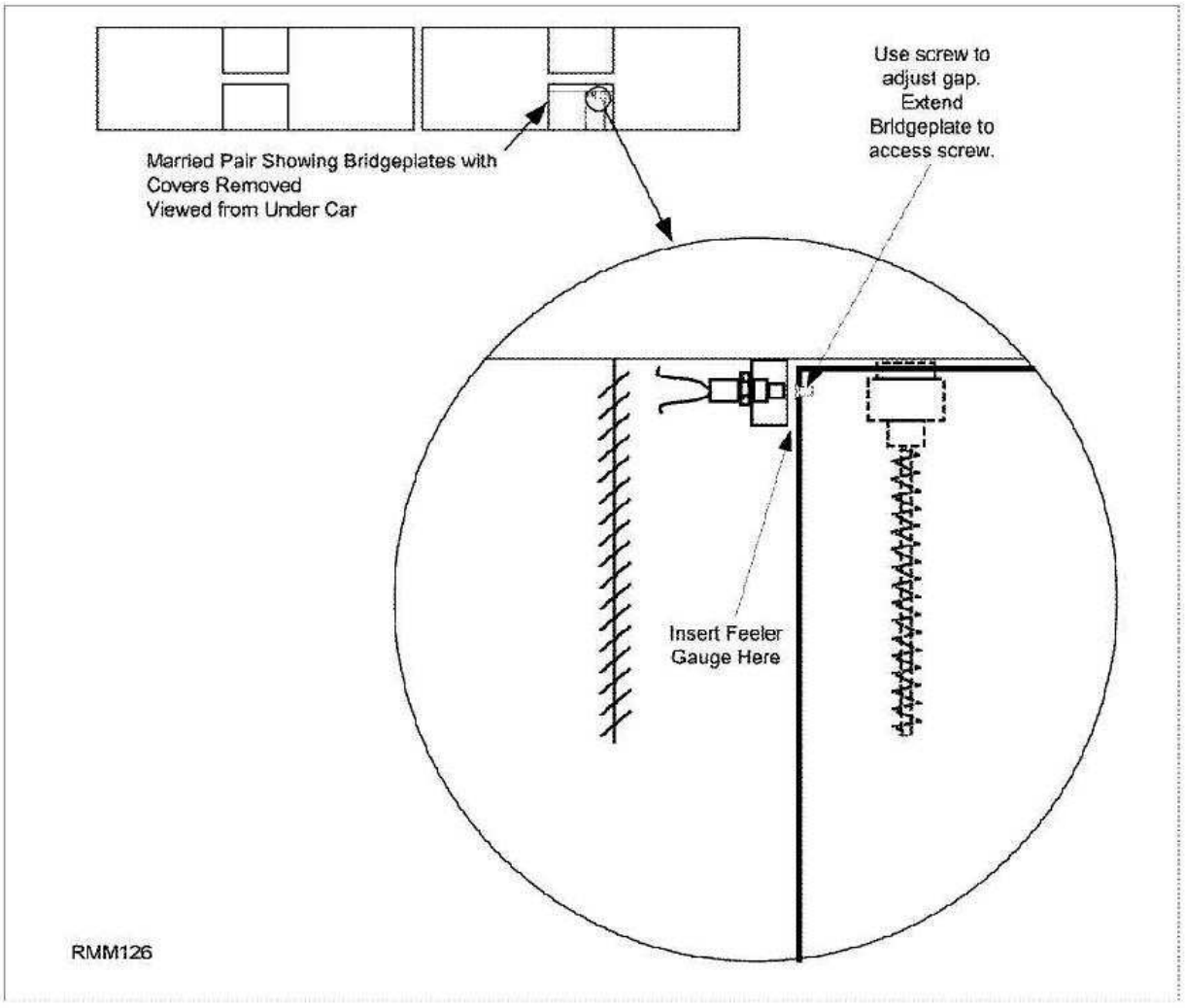

Use screw to adjust gap. Extend Bridgeplate to access screw.
Married Pair Showing Bridgeplates with Covers Removed Viewed from Under Car
Insert Feeler Gauge Here
RMM126

Figure 4-2.87. Proximity Switch Gap

15. Using a feeler gauge check the proper gap on the proximity switch. The recommended gap is 0.06” to 0.100”. As an example, if the target value

for gap adjustment is 0.090", insert a 0.090" thick feeler gauge between the proximity switch and the target (refer to Figure 4-2.87).) (if the 0.090" feeler gauge can be inserted, the gap is at least 0.090"). If adjustment is required, turn the screw (see Figure 4-2.87) clockwise (CW) to increase the gap or counter-clockwise (CCW) to reduce the gap.

16. Turn ON the bridgeplate power. Deploy and retract several times to verify smooth operation. Ensure that a platform is present, seven to eight inches above the top of the rail (it could be replaced with a support set at a convenient height, placed at a proper distance).

17. Swing the bottom cover section into position and install the button head screws. Torque the screws to 25 +/-1 inch/lbs.

18. Reset the bridgeplate motor and interlock bypass switches to the ON position

i) Ramp Alignment

NOTE:	**Adjust only when required: after an accident or during major repair** *

1. Place the bridgeplate in the partially deployed position. Loosen the roller guides located near the edge of the ramp. Rotate the roller guide eccentric pins until there is a maximum gap between the rollers and the side rails of the ramp.

2. Place a 1" (25 mm) spacer between the rear tube of the frame and each carriage plate.

3. Manually rotate one of the screws to slowly bring the bridgeplate into the stowed position.

4. Verify that support ramp carriage plates simultaneously make contact with the spacers. If not, loosen the tensioner for the outer belt and remove belt. Rotate the screw as required to properly align the ramp assembly making sure that both spacers are making contact with the carriage plates.

5. Carefully reinstall the belt and tensioner and verify adjustment.

6. With the ramp in the partially deployed position, place a 0.032" (0.8 mm) feeler gauge between the side rail of the ramp and the roller guide. Turn the roller guide eccentric pin until the roller makes contact with the feeler gauge. Tighten the guide roller mounting hardware to secure adjustment. Repeat adjustment for the roller on the opposite side.

7. Manually rotate the drive screws to slowly bring the ramp into the fully stowed position. Verify that the lock pins simultaneously engage the sidetracks. If the pins do not engage at approximately the same time (within 0.06" (1.5 mm) of movement), verify ramp alignment as described in steps 3.1.1 through 3.1.6.

8. Measure the bridgeplate obstruction force by closing and opening the bridgeplate using the crew key switch. Measure the bridgeplate force along the same plane as the bridgeplate movement and exactly opposite to it. The measured force must be less than 45 Ib. If the obstruction force is higher, use the PTE (refer to Maintenance Manual) to make minor incremental adjustments.

ii) Belt Tension Adjustment

1. Place the bridgeplate in the stowed position.
2. Insert force gauge push rod in the rear tube through the slot under the bridgeplate motor.
3. Place the gauge push rod as far from the motor shaft as possible. Push the bottom section of the belt towards the top section of the belt until both sections touch each other. The force applied should be 20 to 35 lbs (refer to Figure 4-2.88).
4. If adjustment is required, loosen belt tensioner roller nuts and adjust accordingly.
5. Check belt tension again to verify adjustment.
6. Tighten tensioner nuts to secure adjustment.
7. Repeat procedure for remaining belt.

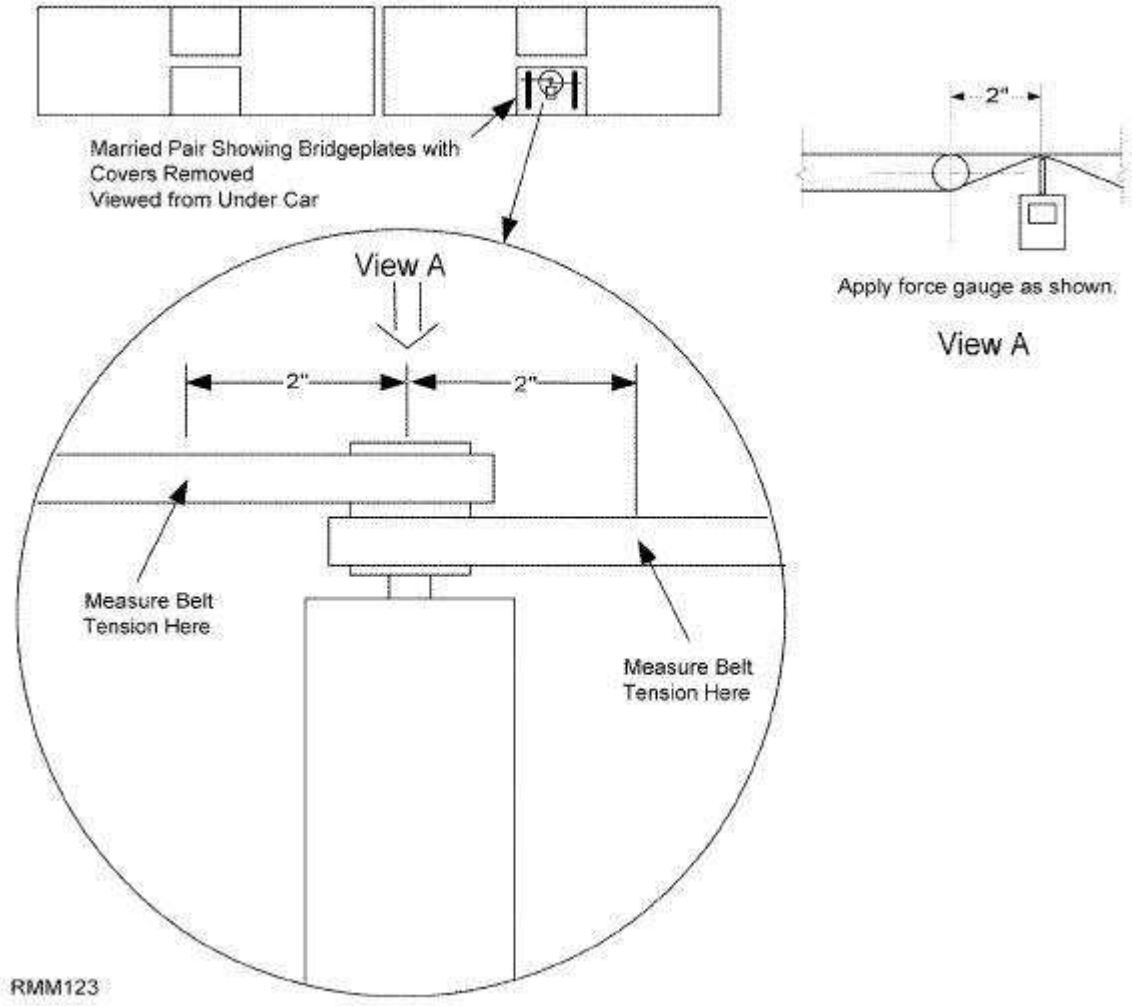


Figure 4-2.88. Belt Tension

iii) Solenoid and Bracket Assembly Adjustment

1. Place bridgeplate in stowed position.
2. Check that the lock pins are engaged with the sidetracks.
3. Loosen the screws securing the solenoid and bracket assemblies to the carriage plates.
4. Adjust the orientation of each solenoid so that it is in line with the lock link (centerline of the link and solenoid should be approximately in line). Check that all hardware and “C”-clips are present.
5. Tighten the solenoid bracket mounting hardware.

iv) Lock Switch Adjustment

1. Place bridgeplate in the stowed position.
2. Check that the lock pins are engaging the sidetracks

3. Loosen the screws securing the switch mounting brackets to the support plates

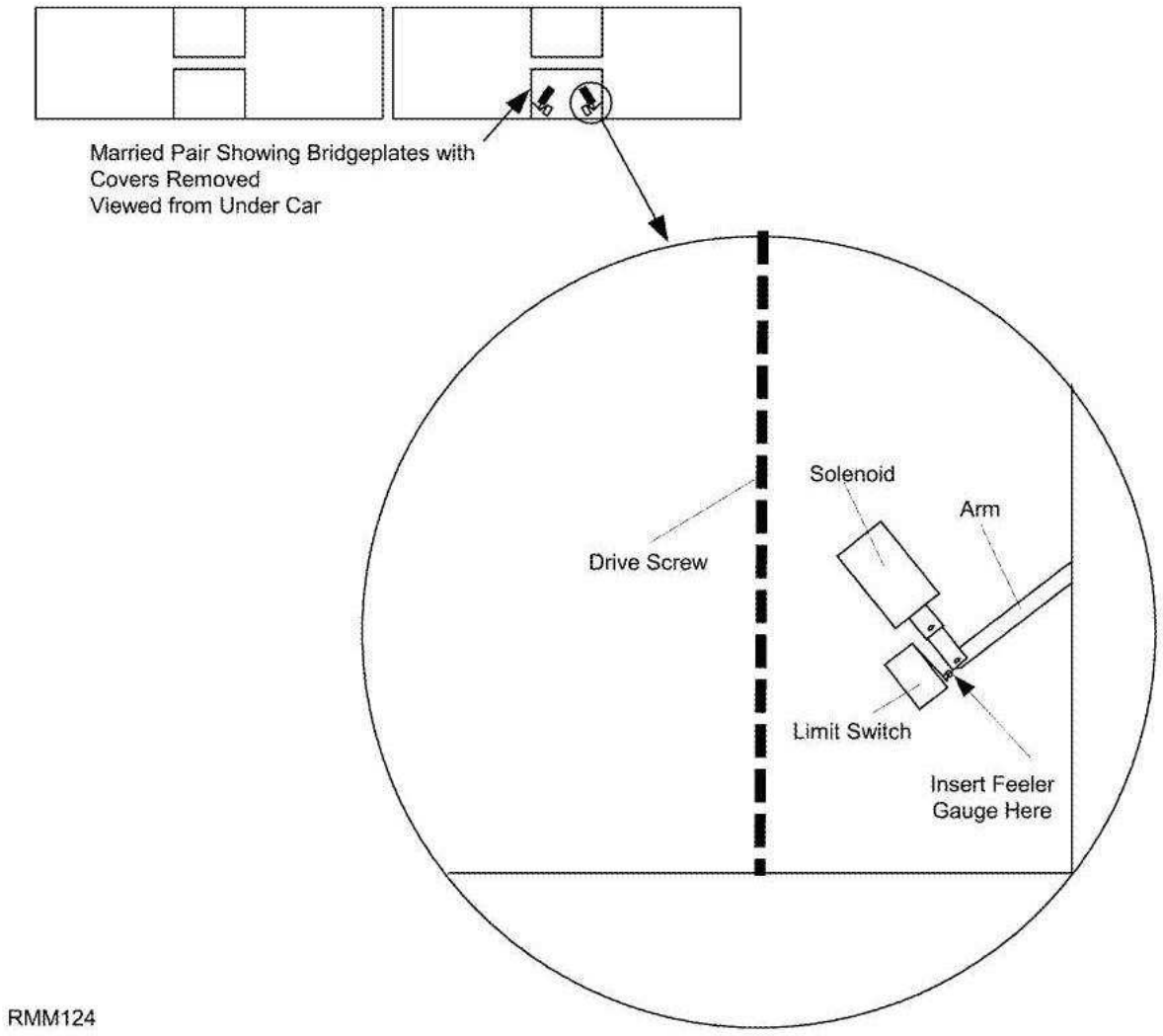


Figure 4-2.89. Lock Switch

4. Insert a 0.062” (1.5 mm) thick feeler gauge between the switch lever and lock lever at the point of contact (refer to Figure 4-2.89).
5. Slide the switch and bracket assembly towards the lock lever until the switch lever bottoms against the feeler gauge and the switch is fully actuated.
6. Tighten the two screws securing the switch and bracket assembly to the support plate.
7. Manually actuate the lock lever and verify that the linkage clears the switch. Verify proper switch actuation (0.062” (1.6 mm).

8. Apply Glyptal to the switch bracket mounting hardware to complete adjustment.
9. Repeat above steps for the switch on the opposite side.

v) Manual Release and Stow Verification

1. Place ramp in the fully deployed position. Verify that locks engage with sidetracks.
2. Cutout motor circuit. Actuate manual release lever on each side of assembly. Push down on ramp slightly to prevent locking pins from re-engaging with the sidetrack.
3. Manually push the ramp into the stowed and lock position. Measure the force required to manually push the ramp with a force gauge once the ramp is placed in a horizontal position. This force should not exceed 45 lbs.

b) Test

i) Bridgeplate Testing

1. Retract and deploy several times to verify smooth operation. Ensure that a platform is present, seven to eight inches above the top of the rail (it could be replaced with a support set at a convenient height, placed at a proper distance).
2. Command the bridgeplate to fully deploy. Turn OFF the bridgeplate motor power and interlock switches located on the door operator assembly.
3. Actuate the manual unlock levers to release the ramp.
4. Manually place the ramp in a horizontal position. Measure the force required to manually stow the ramp using a force gauge. The force required to manually stow the ramp should not exceed 45 Ib

4-2.3 Door Control Module

4-2.3.a Description & Operation

a) Description

Each vehicle door is equipped with one Door Control Module. Two tipes of DCM are installed in the vehicle as follows:

- One DCM (located above the A1 and B1 doors) (Refer to Figure 4-2.90) is a single microprocessor based controller that operates the biparting, folding end doors.

- Two DCMs (located above the A2, A3, B2 and B3 doors) (Refer to Figure 4-2.90) are a single microprocessor based controls that operate the biparting, folding side doors and the related bridgeplate.

Each DCMs also provide door and bridgeplate status information through the trainline and determines the door and bridgeplate status through motor current, limit switches, position sensors, encoders, and pressure sensors that are actuated, as applicable:

- when the doors are closed and locked (DOOR CLOSED sensor and OVERCENTER switch);
- when the bridgeplate is retracted fully, and locked in the retracted position (BRIDGEPLATE RETRACTED sensor and two BRIDGEPLATE LOCKED switches);
- when the bridgeplate is deployed completely, and locked in the deployed position (two BRIDGEPLATE LOCKED switches);
- when the bridgeplate is obstructed during deployment (motor current and position versus time table);
- when the bridgeplate is loaded during deployment or retraction (motor current and position versus time table);
- when the doors are fully opened (encoder and counter);
- when the doors are obstructed during closing (either or both SENSITIVE EDGE switches and position versus time table);
- when a door has been taken out of service (DOOR OUT-OF-SERVICE switch and DOOR OUT-OF-SERVICE circuit breaker);
- when the bridgeplate is taken out of service (BRIDGEPLATE OUT-OF-SERVICE switch and BRIDGEPLATE MOTOR POWER switch).

The DCM also monitors the train status signals, including the NO MOTION signal. Without the NO MOTION signal the control module will not provide an OPEN signal to the doors not a DEPLOY signal to the bridgeplate.

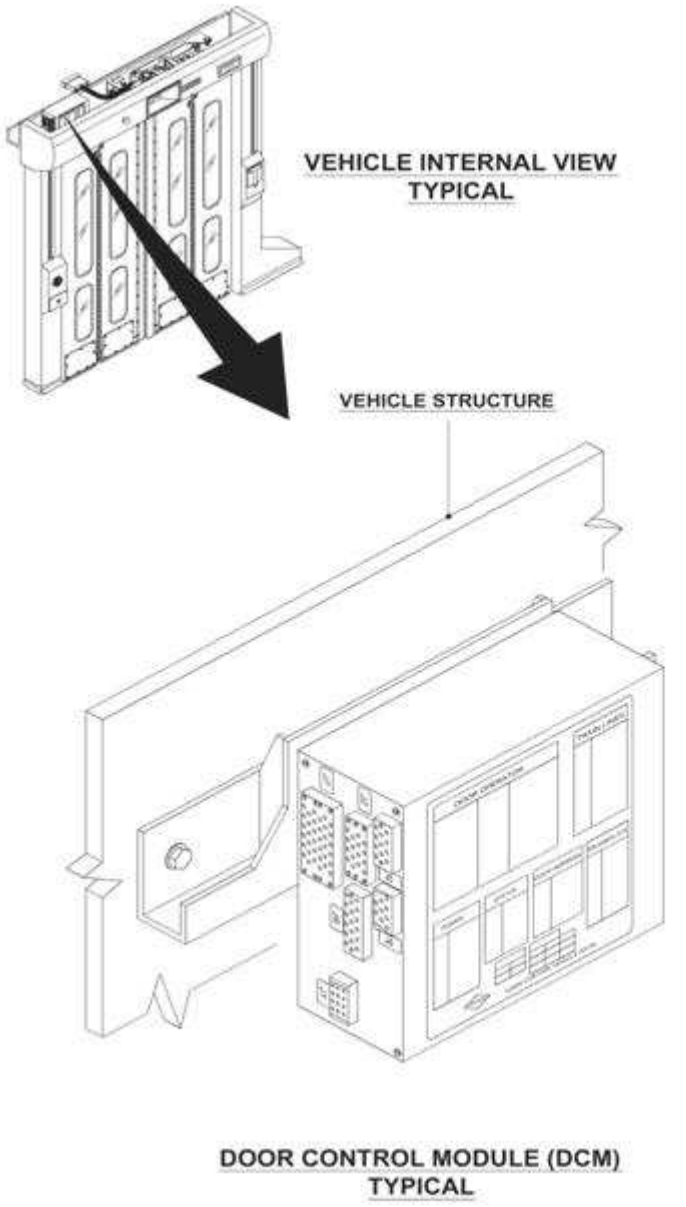


Figure 4-2.90 Door Control Module (DCM) - Location

Operation

The DCM receives status information from the doors and bridgeplates and from the trainline to coordinate the operation of the doors and bridgeplates with the vehicle stopped. The information required and provided by the DCM, and how he DCM operates the doors and bridgeplate, are the following:

1. DCM opens the doors;

2. DCM deploys the bridgeplate;
3. DCM retracts the bridgeplate;
4. DCM closes the doors.

1. Door Opening and Closing

With a NO MOTION signal and the DOOR UNLOCK and DOOR OPEN signals from the trainlines present, the DCM provides power to the door operator and opens the doors.

At a signal from the trainline, the DCM initiates the audible open/close signal and then commands the doors close. The doors close and lock. The CLOSED/LOCKED signal is provided to the door module control from the proximity switches that are tripped by the door roller brackets when the door reaches the CLOSED/LOCKED position and the operator has reached the overcenter position, engaging the OVERCENTER switch.

2. Bridgeplate Deployment

The bridgeplate can only be deployed with the vehlicle doors completely open. The door module control must also be receiving a NO MOTION signal and a BRIDGEPLATE DEPLOY signal from the trainlines. The controller provides an audible warning signal at the car doors, and then provides power to the bridgeplate pull solenoids, which withdraw the locking plates and locking pins, unlocking the bridgeplate.

Withdrawing the locking plates opens the BRIDGEPLATE LOCKED switches, providing the door module control with the information that the bridgeplate is unlocked. The door module controller provides power to the bridgeplate motor and deploys the bridgeplate. The audible signal begins two seconds before deployment begins and continues during bridgeplate deployment, which takes 10 to 12 seconds. The door controller monitors the motor current and the position versus time table during bridgeplate deployment to make sure the bridgeplate is not being driven into an obstruction.

When the bridgeplate is fully deployed, the motor encoder and BRIDGEPLATE LOCKED switches provide the door module control with the fully deployed information.

The DCM removes power from the pull solenoids. When the solenoids are de-energized, the spring-loaded locking plates pivot and push the locking pins into the outboard locking slots. When the locking pins are fully engaged in the locking slots, the locking plates contact and close the LOCKED switches. This provides the DEPLOYED and LOCKED information to the door module control.

3. Bridgeplate Retraction

In the bridgeplate retraction sequence, the door module control provides power to the pull solenoids, which retract the locking plates. When the locking pins are retracted from the deployed position locking slots, the door module control powers the bridgeplate motor and retracts the bridgeplate. The bridgeplate reaches the fully retracted position in eight to ten seconds. The door module control removes power from the motor and the pull solenoids. The locking plates pivot and drive the locking pins, pushing them into the inboard (retracted) locking slots. As the locking pins seat, the locking plates contact the LOCKED switches. In the fully retracted position, the bridgeplate also actuates the STOWED proximity sensor. This allows the car doors to be closed and locked.

4. Door Out-Of-Service

If a door is taken out of service, a switch that is made by moving the door out-of-service lever from the NORMAL position to the DOOR OUT-OF-SERVICE position notifies the DCM. With the door is out of service, the DCM cannot deploy the bridgeplate at the car stops.

4-2.3.b Specific Safety precautions

WARNING:	**BEFORE PERFORMING DOOR CONTROL MODULE (DCM) ASSEMBLY EQUIPMENT MAINTENANCE PROCEDURES DISCONNECT ELECTRICAL POWER FROM VEHICLE BY SWITCHING OFF THE BATTERY CB (3Q03).**

4-2.3.c Fault/Isolation

The Door Control Module (DCM) Fault Isolation/Repair, is included in Doors Fault Isolation/Repair procedure, refer to section 4-2.c

4-2.3.d Disassembly

- **Reference Information.**
  1. Tools / Equipment.
     – MBTA Overhaul Standard Tools Kit.
  2. Material (Not Applicable).
- **Procedure**

a) Removal of Door Control Module

Remove the Door Control Module for heavy maintenance as described Procedure

To Remove each Door Control Module (DCM) proceed as follows (Refer to Figure 4-2.91):

1. Set the Vehicle in safety condition in accordance with MBTA Carhouse Regulations.
   – Switch OFF the Battery Circuit Breaker (CB 3Q03 – Battery Box).
2. Disconnect the connector, listed below, from Door Control Module (4) as shown in the figure:
   – Connector J1;
   – Connector J2;
   – Connector J5;
   – Connector J6;
   – Connector J7;
3. Support the DCM (4) and remove nuts (1) and washers (2, 3).
4. Remove DCM.

b) Disassembly of Door Control Module

General Disassembly Instructions

Observe the general overhaul instructions provided below during overhaul of any door and bridgeplate system component.

Overhaul of all components is accomplished by parts replacement at assembly.

Before beginning reassembly, gather all the parts required for complete rebuild of the component. Make sure all expendables, all special tools, and all fixtures required to rebuild and test the component are available.

Replace all threaded fasteners, O-rings, retaining rings, switches, bearings, bushings, solenoids, and age sensitive components at overhaul. These have been discarded as part of the disassembly for overhaul. Make sure none of these parts are reused during an overhaul.

Replace any part that is corroded, or whose corrosion protection is worn through.

Make sure all threaded fasteners are properly retained using self-locking devices, lockwashers, thread locking compounds, or lockwire, as defined in the assembly instructions.

Perform all in-process checks as defined in the specific reassembly instructions.

Overhaul of the relay assemblies consists of parts replacement. The wiring harness is not repairable.

Disassembly Instructions as follows

Refer to Figure 4-2.91. Door Control Module.

1. Remove eight screws (8) and lockwashers (9), and release the end plate and pad assembly (5) and the end plate and screen assembly (6). Slide the end plates and attached components from the box assembly (7).
2. Remove and discard screws (13), screws (17), and washers (14) from the mounting posts (12).
3. Remove the screws (16 and 21). Separate the printed circuit boards (1 through 4), the PCB input adapter assembly (19), and the mounting posts (15 and 20).
4. Remove the mounting pads (18).
5. Remove the mounting posts (22).
6. Do not remove the identification labels (10 and 11) unless they are illegible or damaged

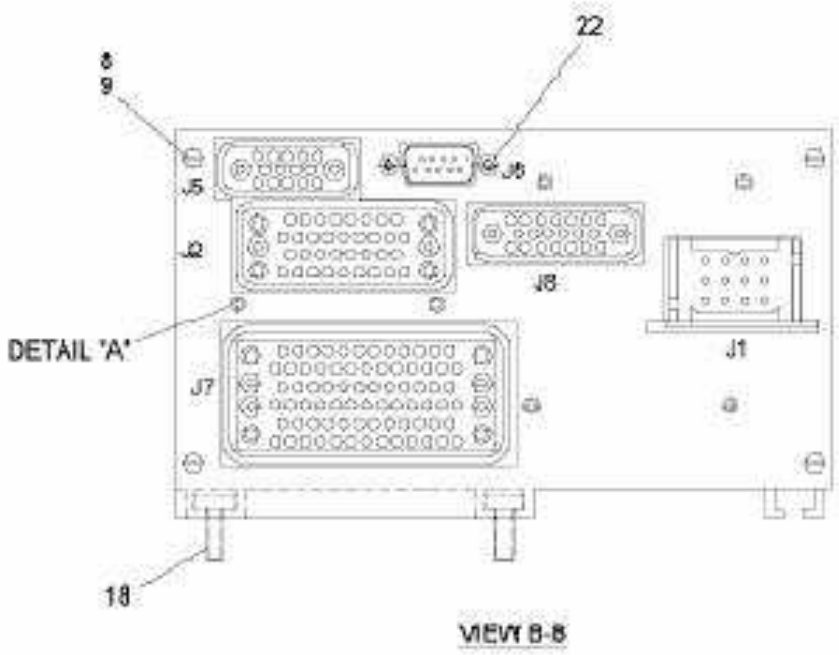


Figure 4-2.91. Door Control Module (Sheet 1 of 2)

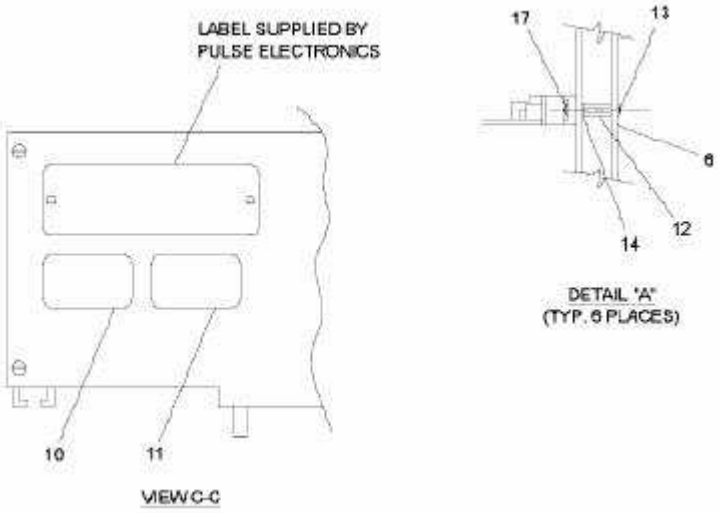


Figure 4-2.91. Door Control Module (Sheet 2 of 2)

ITEM NO.	PART NAME	QTY	ITEM NO.	PART NAME	QTY
	Door Control Module				
1	Microprocessor Board	1	12	Mounting Post	6
2	Driver Board	1	13	Screw	6
3	LED Board	1	14	Lockwasher	6
4	Interface Board	1	15	Mounting Post	4
5	End Plate and Pad Assembly	1	16	Screw	8
6	End Plate and Screen Assembly	1	17	Screw	6
7	Box and Label Assembly	1	18	Mounting Pad	2
8	Screw	8	19	PCB Input Adapter Assembly	1
9	Lockwasher	8	20	Mounting Post	4
10	Identification Label	1	21	Screw	8
11	Identification Label	1	22	Mounting Post	2

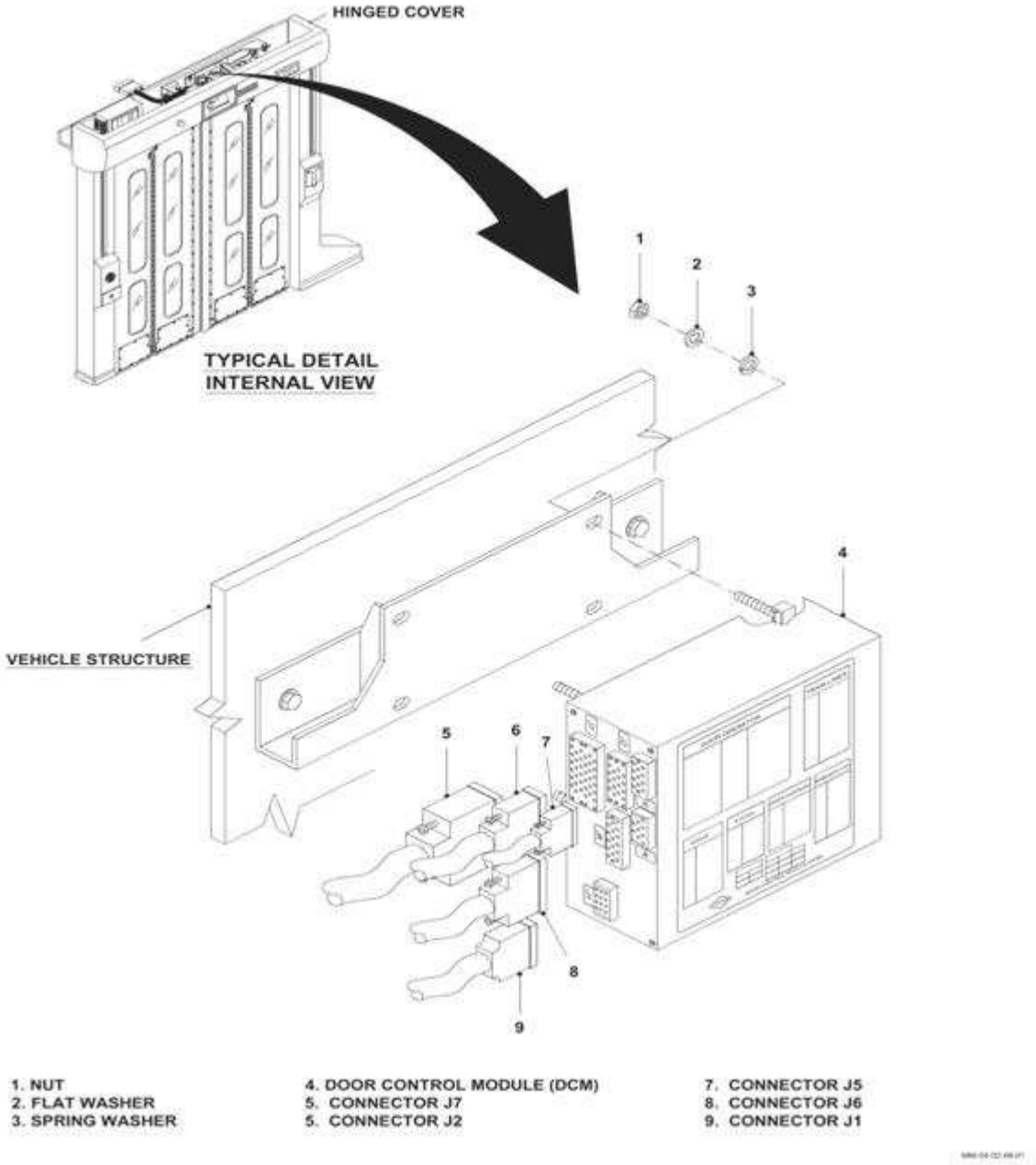


Figure 4-2.92 Door Control Module (DCM) - Removal/Installation (Typical)

4-2.3.e Cleaning/Painting

a) Cleaning

WARNING:	**BEFORE PERFORMING DOOR CONTROL MODULE (DCM) CLEANING PROCEDURE DISCONNECT ELECTRICAL POWER FROM VEHICLE BY SWITCHING OFF THE BATTERY CB (3Q03).**

- **Reference Information.**
  1. Tools / Equipment.
     – MBTA approved Cleaning Tools / Equipment (commercial).
  2. Material.
     – MBTA approved Cleaning Products (commercial) (Refer to Section 1 Table 1-9).
- **Procedure.**

  To Clean each Door Control Module (DCM) proceed as follows:

  1. Set the Vehicle in safety condition in accordance with MBTA Carhouse Regulations.
     – Switch OFF the Battery Circuit Breaker (CB 3Q03 – Battery Box).
  2. Clean and dry DCM surface using mild detergent diluted in water, brush and cleaning rags. (refer to Table 1-9 for MBTA approved cleaning Product List)

b) Painting (Not Applicable)

4-2.3.f Inspection

- **Reference Information.**
  1. Tools / Equipment (Not Applicable).
     – MBTA Carhouse Standard Tools Kit.
  2. Material (Not Applicable).

Inspect the controller components according to the specific instructions provided in Table 4-2.35.

Table 4-2.35. Controller Component Inspection Methods and Criteria

FIGURE AND ITEM	PART NAME	INSPECTION METHODS AND CRITERIA
Figure 4-2.91 -1 -2 -3	Printed circuit board	Visually inspect for damage and deformation. Replace damaged or deformed printed circuit boards. Inspect the board and components mounted on the board for evidence of overheating, as indicated by discoloration of the components or the conformal coating.
-4		Replace printed circuit boards that have heat discolored components.
-5	End plate and pad assembly	Visually inspect for damage and deformation. Inspect for corrosion. Replace the end cover if it is damaged or deformed. Remove corrosion. If a corroded component is reusable, renew the corrosion protection before reassembling the controller box and frame.
-6	End plate and screen assembly	Visually inspect for damage and deformation. Inspect for corrosion. Replace the end cover if it is damaged or deformed. Remove corrosion. If a corroded component is reusable, renew the corrosion protection before reassembling the controller box and frame. Inspect the connectors for damage, deformation, and loose connector pins. Replace damaged and deformed connectors and connectors having loose pins
-7	Box and label assembly	Visually inspect for damage and deformation. Inspect for corrosion. Replace the housing extrusion if it is damaged or deformed. Remove corrosion. If the housing is corroded but is reusable, renew the corrosion protection before reassembling the controller box and frame.

4-2.3.g Repair (Not Applicable)

4-2.3.h Reassembly

- **Reference Information.**
  1. Tools / Equipment.
     – MBTA Overhaul Standard Tools Kit.
  2. Material (Not Applicable).
- **Procedure**

General Overhaul Instructions

Refer to Table 4-2.35 Overhaul the controller by replacing worn or damaged components. Replace printed circuit boards if there are any defects on the boards.

a) Reassembly

Refer to Figure 4-2.91, Door Control Module.

WARNING: USE A GROUNDING STRAP AND ENSURE THERE IS NO OPEN FLAME IN THE VICINITY.

1. If removed, Install the identification labels (10 and 11). Clean the label application area thoroughly with isopropyl alcohol before pressing the labels into place. Apply pressure at the center and work outward.
2. Install the mounting posts (22).
3. Install the mounting pads (18).
4. Assemble the PCB input adapter assembly (19) and the printed circuit boards (1 through 4) using the mounting posts (15 and 20) and the screws (16 and 21).
5. Use the mounting posts (12), screws (13 and 17), and washers (14) to mount the printed circuit board stack to the end plates (5 and 6).

CAUTION: Do not force the boards. They should glide into the rails easily. If jamming is suspected, inspect boards for derailment or look for rail debris. Remove boards, inspect boards and rails and try again.

6. Slide the end plates and attached components into the box assembly (7). Secure the end plates and attached components in the box assembly using the screws (8) and washers (9).

(A) Battery Replacement

Refer to Figure 4-2.93. Battery Replacement.

i) Materials Required

- **(1) Battery holder, coin cell, (BR2330): P/N 2002W0145**
- **(1) Battery, coin cell BR2330, 3V: P/N 2002W0175**
- **(As required) Conformal coating, brush applied, non-urethane finish**
- **(As required) Clear adhesive, tube, RTV 3145: P/N 841800-03**
- **(As required) Edge sealant, bottle: 93W282**

ii) Tools Required

- **Anti-static work area.**
- **Laptop with MBTA#8 PTU software.**
- **Soldering iron - 800W maximum, medium diameter, pointed tip for components.**
- **Solder, 60-40 Tin-Antimony, electrical grade, rosin core, 1/16" diameter.**
- **Solder sucker or Chem-Wik.**
- **Phillips screwdriver.**
- **Exacto knife.**
- **Assorted hand tools including 1/4" open-end key.**
- **Multimeter, calibrated**

iii) Replace Battery

NOTE:	**BATTERY HANDLING NOTICE: The battery terminals of BAT1 are exposed on solder side of the board and should not be subjected to any short circuit onto conductive surfaces. Storage of the new batteries (2002-W-0175) should also be done preventatively away from any possible conductive surfaces or conductive containers. Do not remove batteries from original containers/packaging until required for immediate installation onto the board.**

NOTE:	**Remove conformal coating from soldered pads concerning modification with Exacto-knife or suitable conformal coating remover.**

1. Locate BAT1 (4, 5). Remove conformal coating from positive and negative pads of BAT1.
2. Heat one pad and pull out one side of the battery pin at a time. Repeat. Unsolder both pads.
3. Verify that none of the traces have been cut.
4. Orient properly, insert battery holder (5), and solder battery holder pins.
5. Use the multimeter to measure battery voltage on BAT1 terminals.
6. Apply conformal coating to all exposed modification soldering, trace cuts and exposed wiring.
7. Mark the revision level in the revision space on the component side of the PCB.

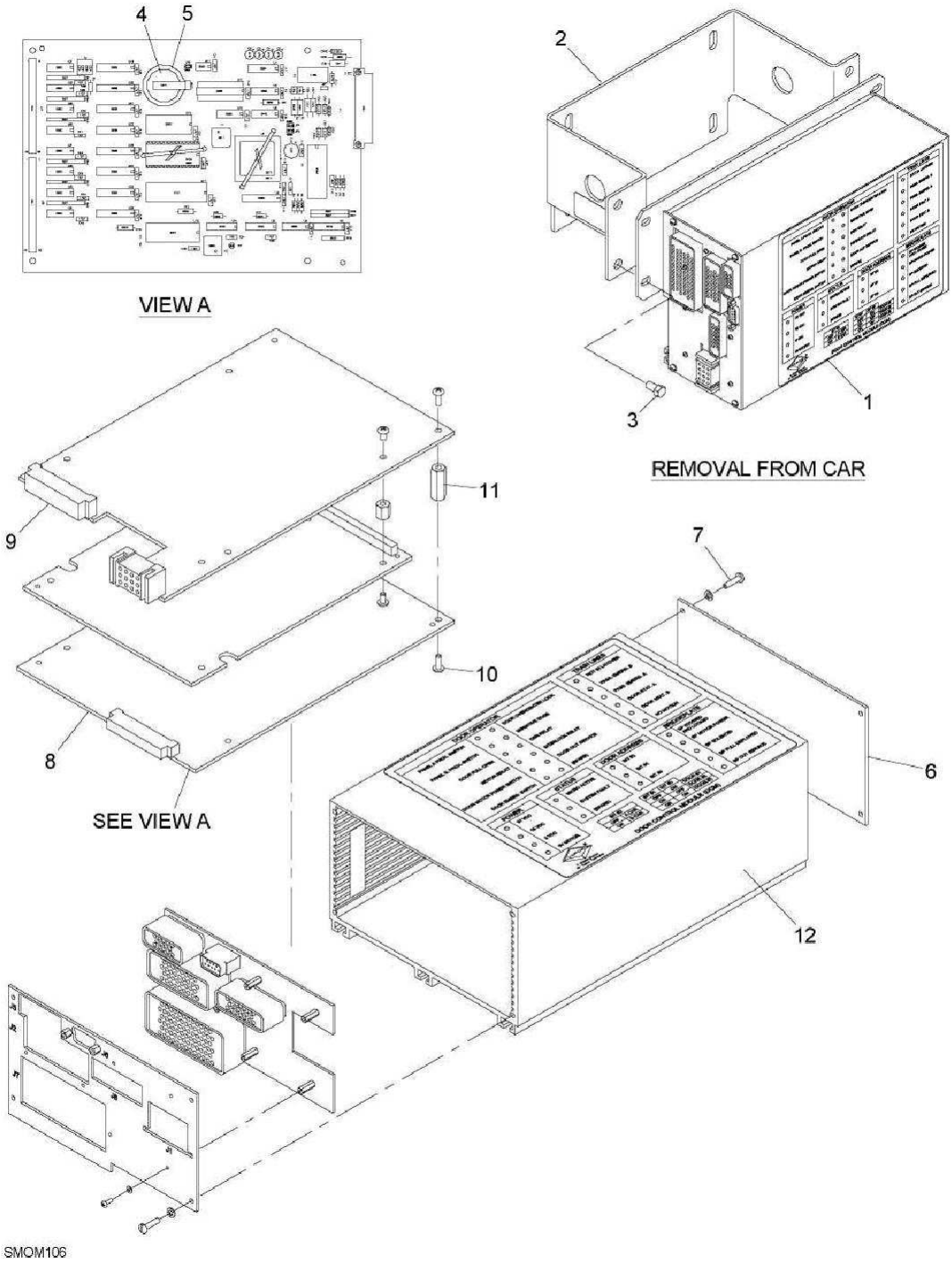


Figure 4-2.93. Battery Replacement

b) Installation

Install the controller as described

To Install each Door Control Module (DCM) proceed as follows (Refer to Figure 4-2.92):

1. Check that the vehicle is in safety conditions in accordance with MBTA Carhouse Regulations.
   – Battery Circuit Breaker (CB 3Q03 – Battery Box) switched OFF.
2. Position DCM (4) in the related seat.
3. Install nuts (1) and washers (2, 3). Tighten nuts (1) as required.
4. Connect the connector, listed below, to the Door Control Module (4) as shown in the figure:
   – Connector J1;
   – Connector J2;
   – Connector J5;
   – Connector J6;
   – Connector J7;

4-2.3.i Adjustment/Test

a) Adjustment (Not Applicable)

b) On-Car Testing

Perform on-car testing as part of the door system test in section 4.4

4-3 Doors and Bridgeplate Electrical System

4-3.a Description and Operation

The door and bridgeplate electrical system (Refer to Figure 4-3.1 and Figure 4-3.2) for an A and B sections is defined graphically in the electrical schematics provided. Each section (A and B) has 3 doors on each side. Each door opening has a dedicated door control module (DCM), which provides both the electrical and control interfaces for the door opening. At the end doors and the center doors, the DCM opens and closes the car door at its opening. For the center doors, the DCM also deploys and retracts the bridgeplate.

During train operation, the DCM receives information that defines car operating status, door status, and control requests through the car and door operating system electrical connections. In response to the door operating requests and the car and system status information, the door module controller provides operating commands to the

door motor and the bridgeplate motor. The controller also provides door and bridgeplate status information to the DCM.

The Figure 4-3.2 showns the electrically and control system for the vehicle car doors and the bridgeplate.

Figure 4-3.1 Electrical Schematic (sheet 1 of 6)

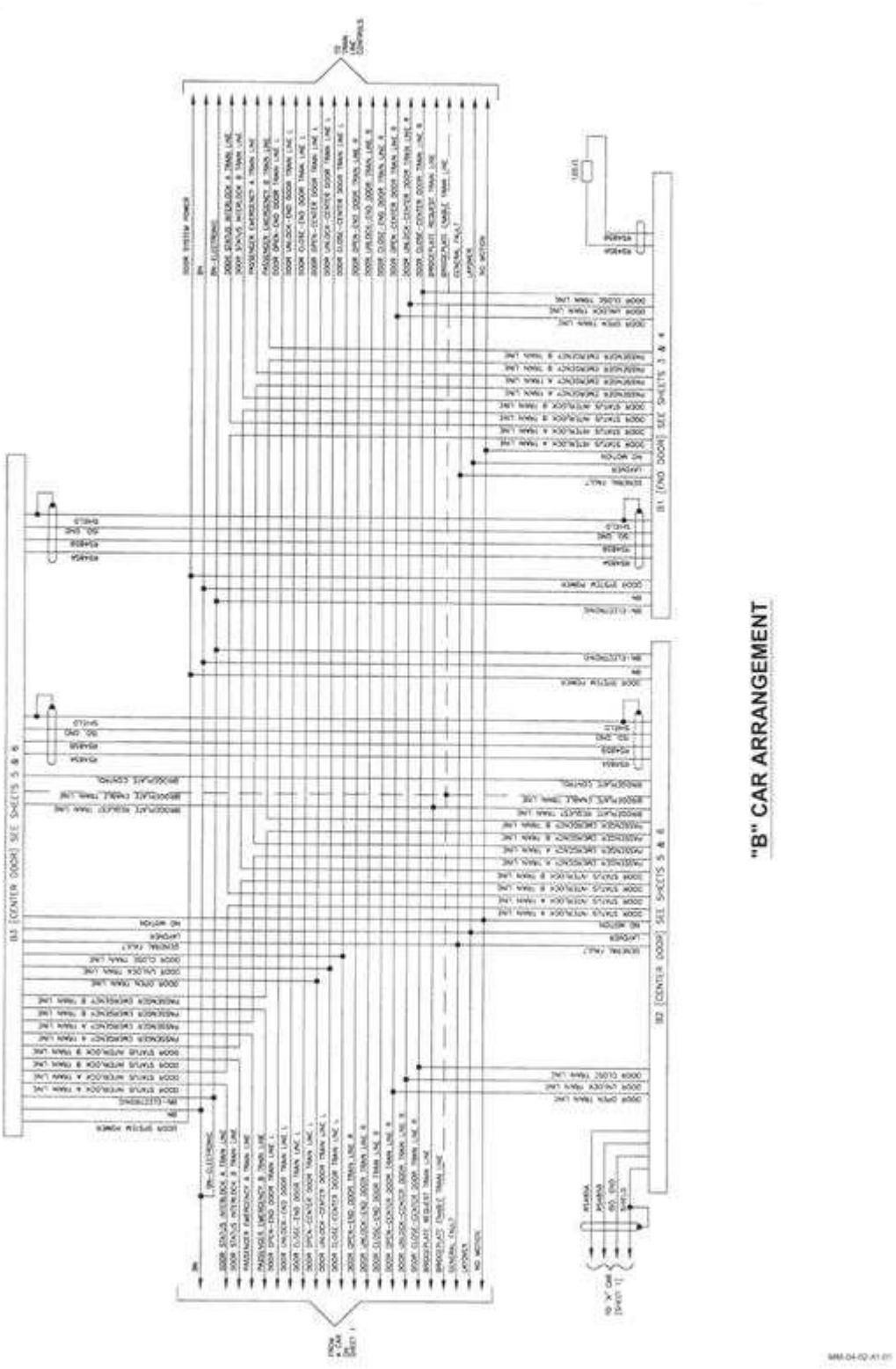


Figure 4-3.1 Electrical Schematic (sheet 2 of 6)

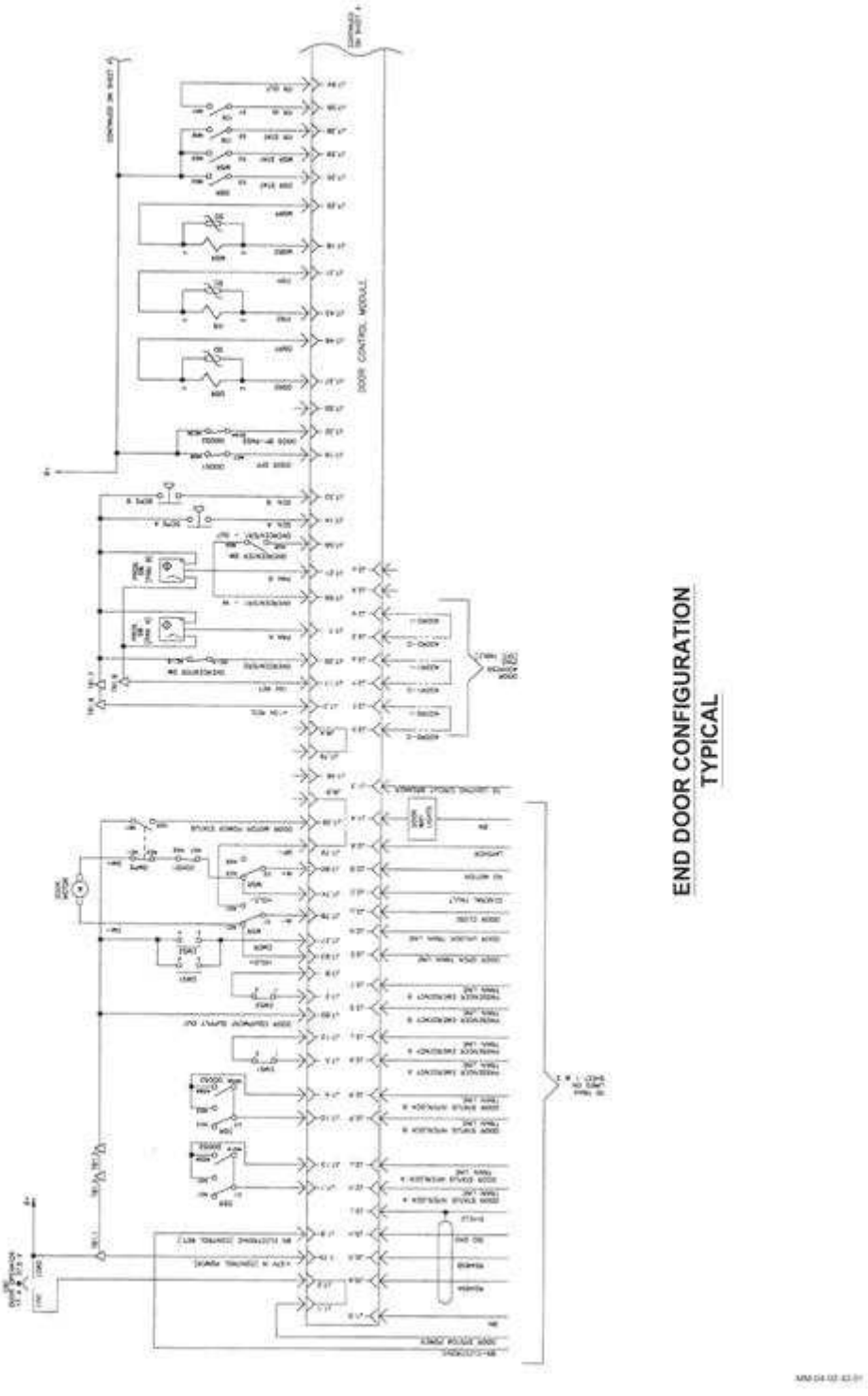


Figure 4-3.1 Electrical Schematic (sheet 3 of 6)

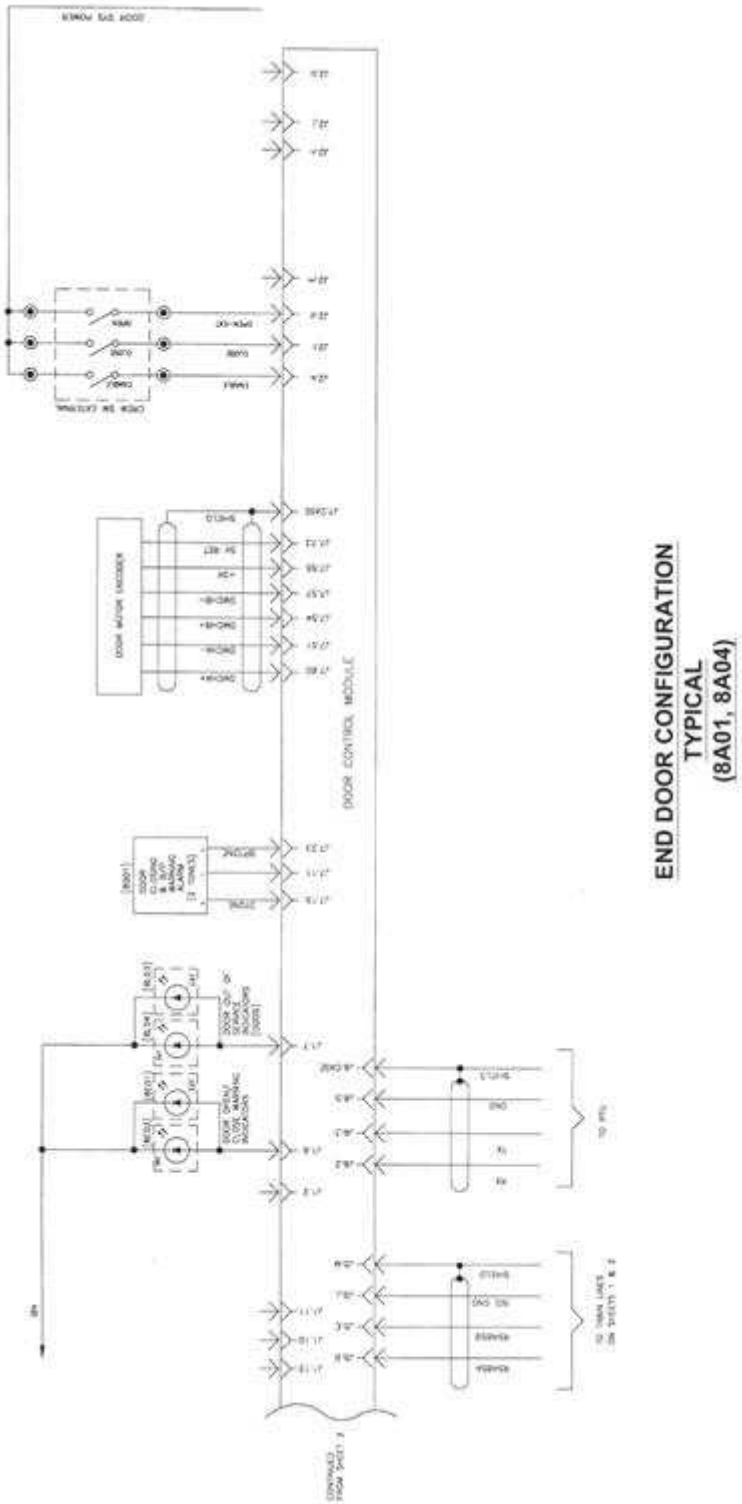


Figure 4-3.1 Electrical Schematic (sheet 4 of 6)

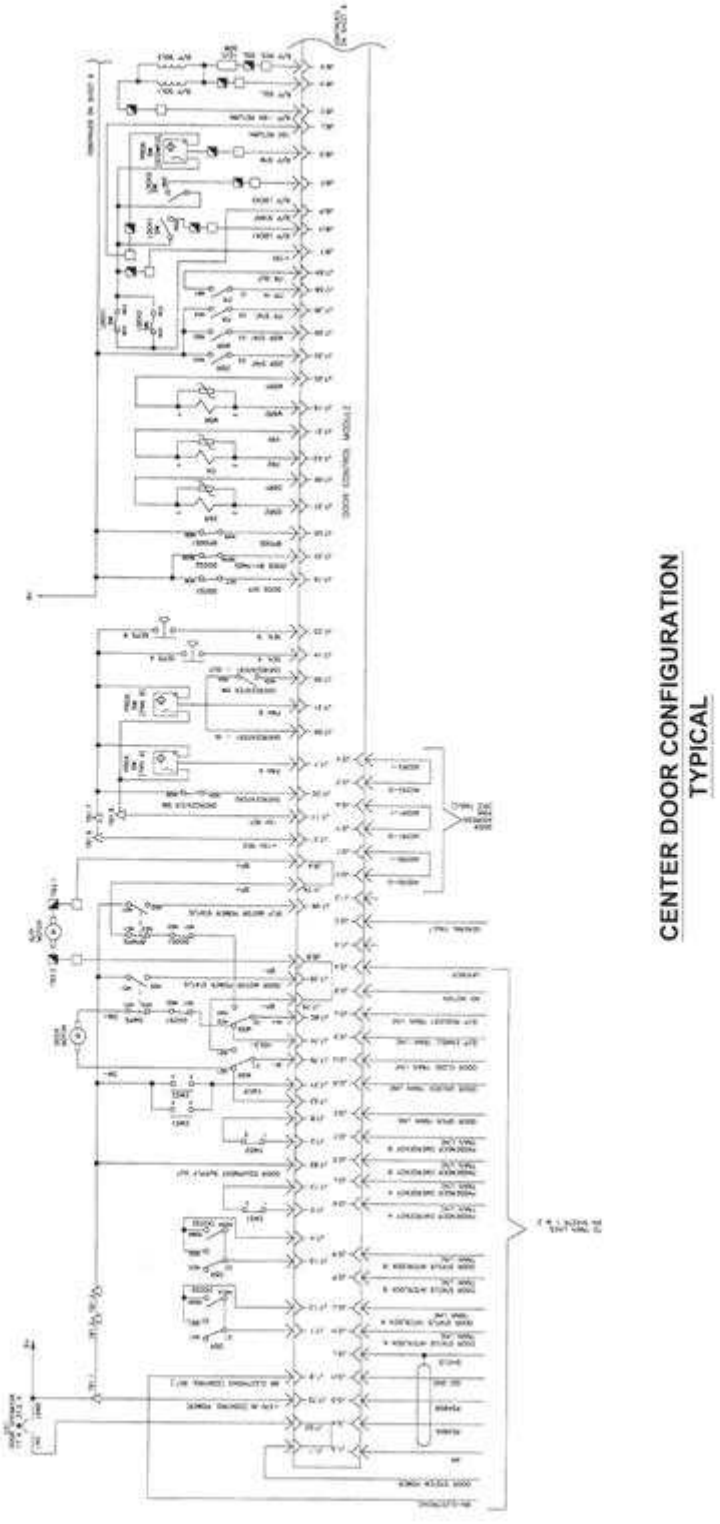


Figure 4-3.1 Electrical Schematic (sheet 5 of 6)

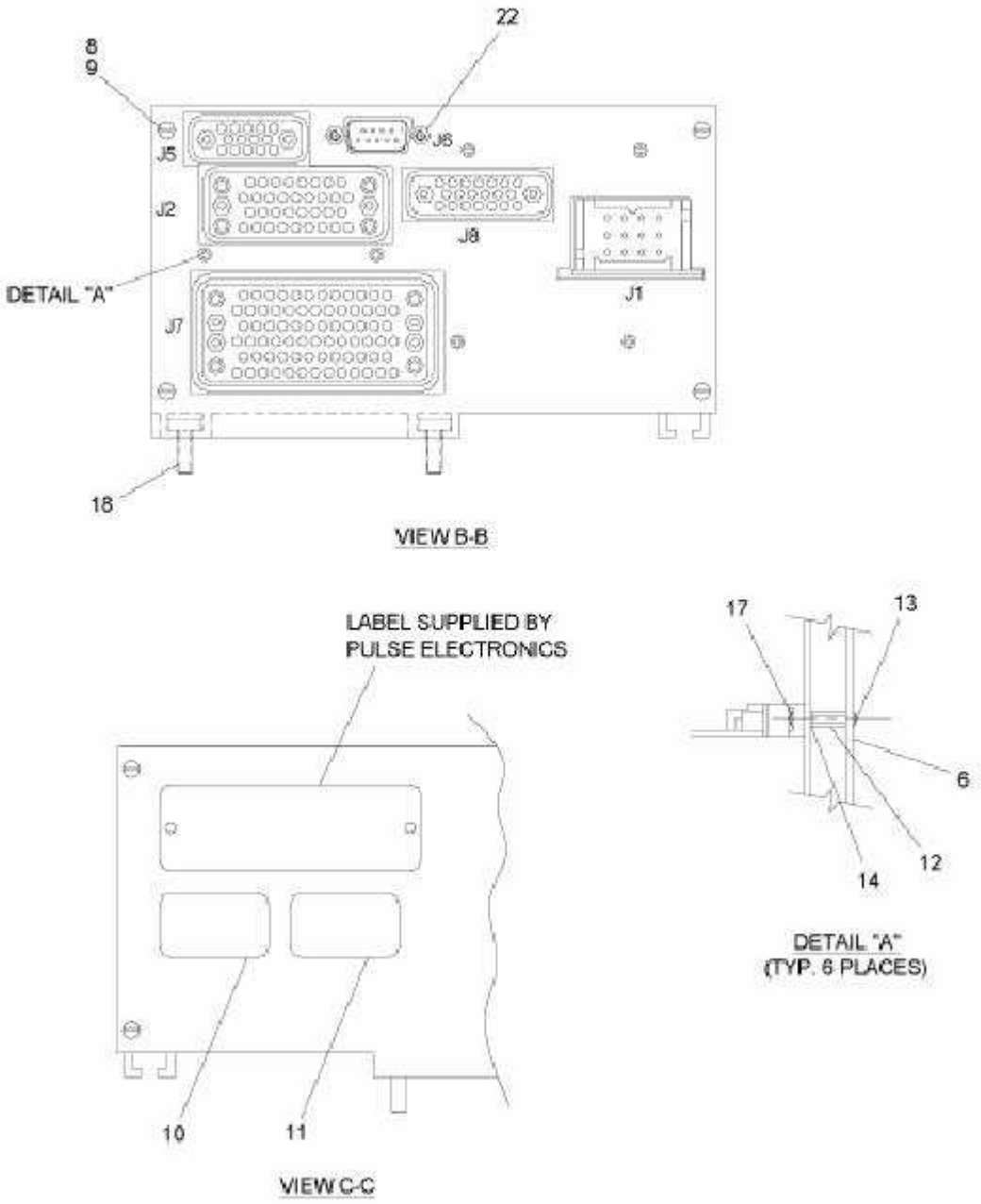


Figure 4-3.1 Electrical Schematic (sheet 6 of 6)

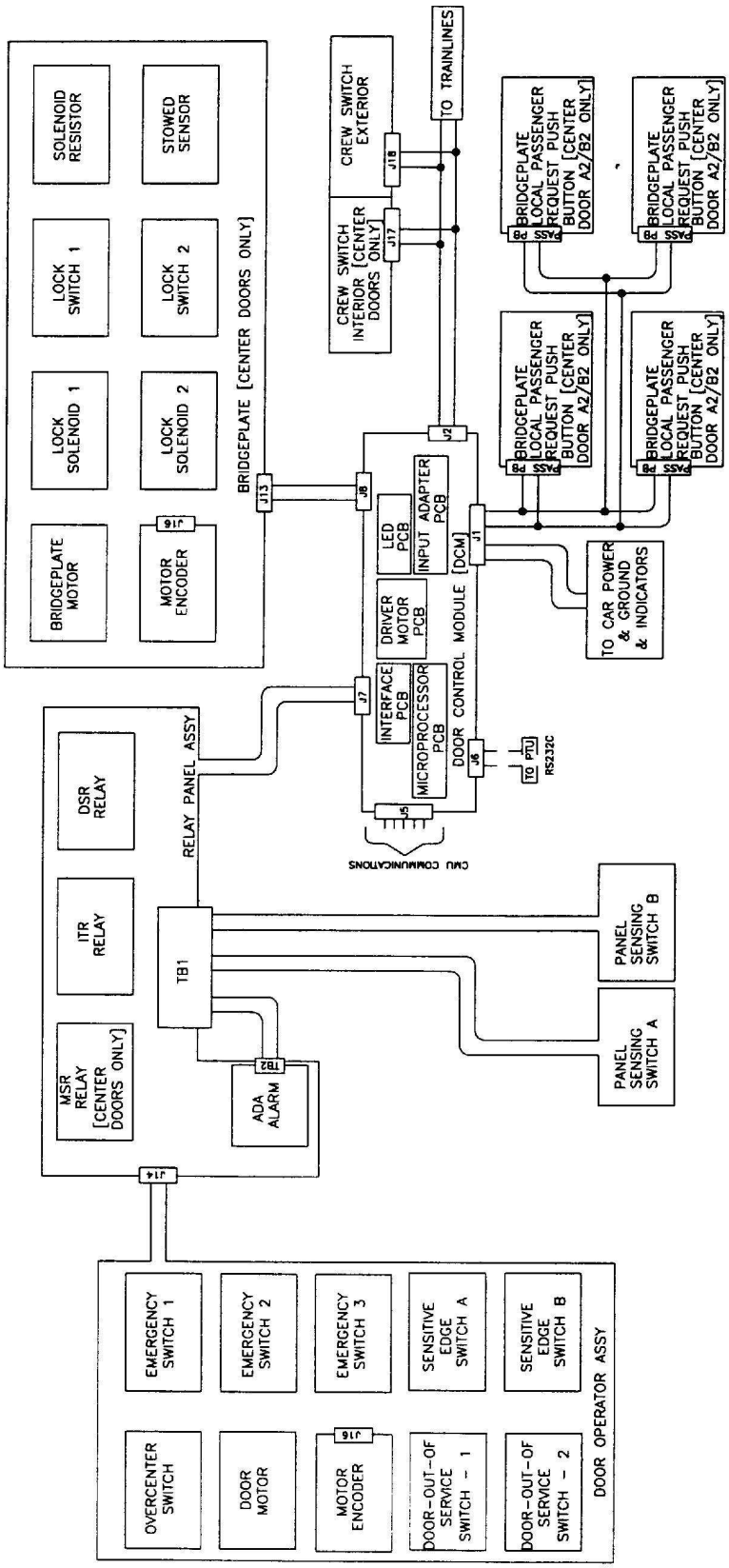


Figure 4-3.2 Door Control Interfaces (sheet 1 of 7)

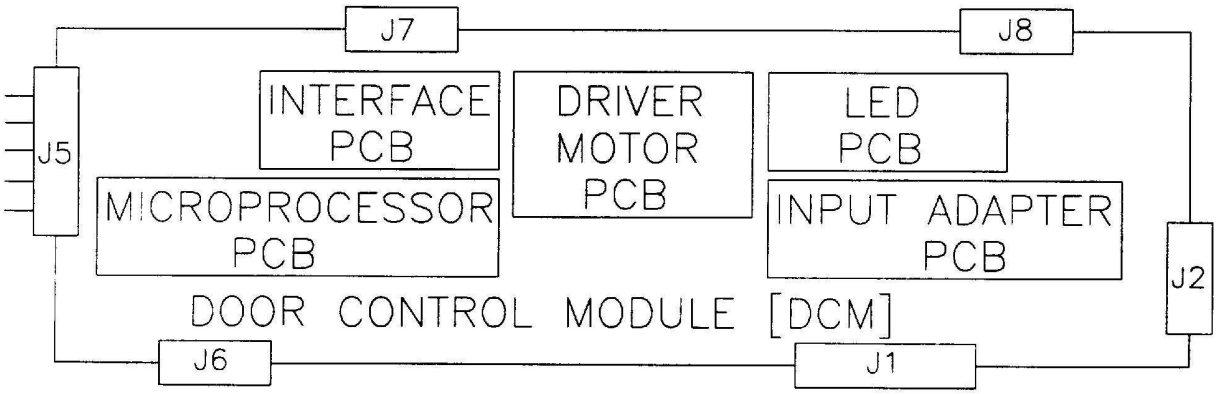


Figure 4-3.2 Door Control Interfaces (sheet 2 of 7)

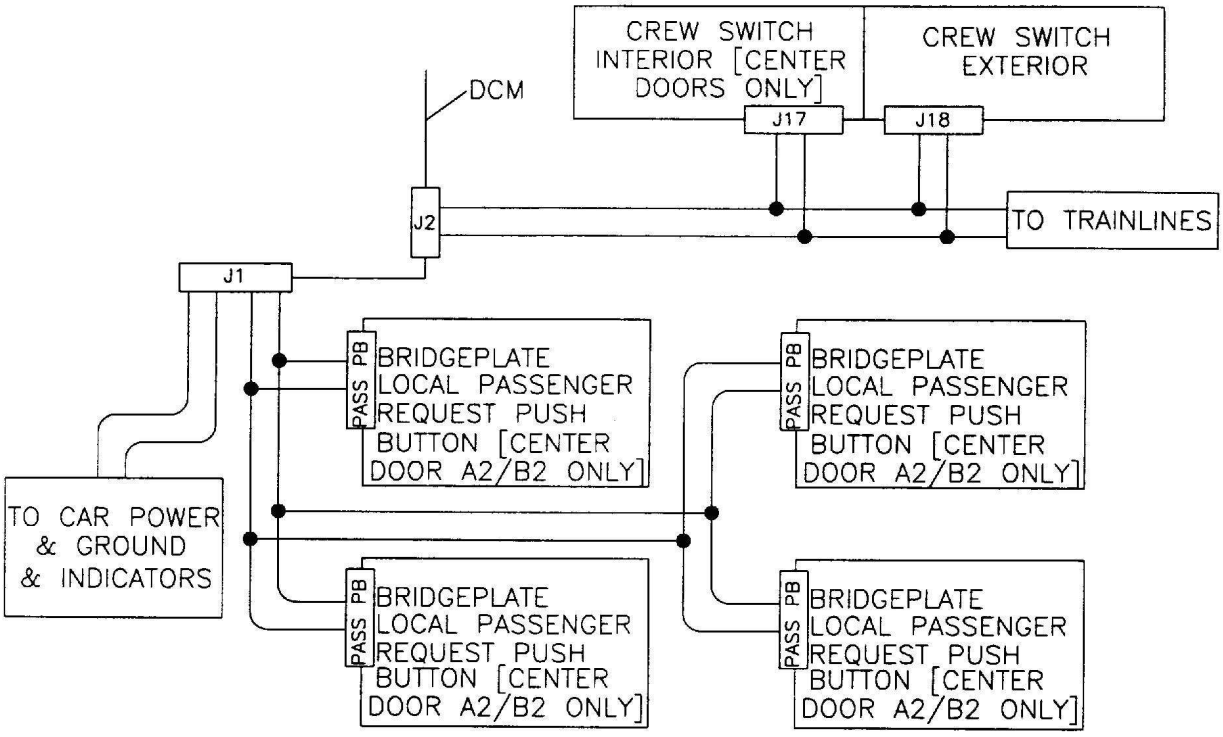

CREW SWITCH INTERIOR [CENTER DOORS ONLY]
CREW SWITCH EXTERIOR
DCM
J17
J18
J2
TO TRAINLINES
J1
PASS PB
BRIDGEPLATE LOCAL PASSENGER REQUEST PUSH BUTTON [CENTER DOOR A2/B2 ONLY]
PASS PB
BRIDGEPLATE LOCAL PASSENGER REQUEST PUSH BUTTON [CENTER DOOR A2/B2 ONLY]
TO CAR POWER & GROUND & INDICATORS
PASS PB
BRIDGEPLATE LOCAL PASSENGER REQUEST PUSH BUTTON [CENTER DOOR A2/B2 ONLY]
PASS PB
BRIDGEPLATE LOCAL PASSENGER REQUEST PUSH BUTTON [CENTER DOOR A2/B2 ONLY]

Figure 4-3.2 Door Control Interfaces (sheet 3 of 7)

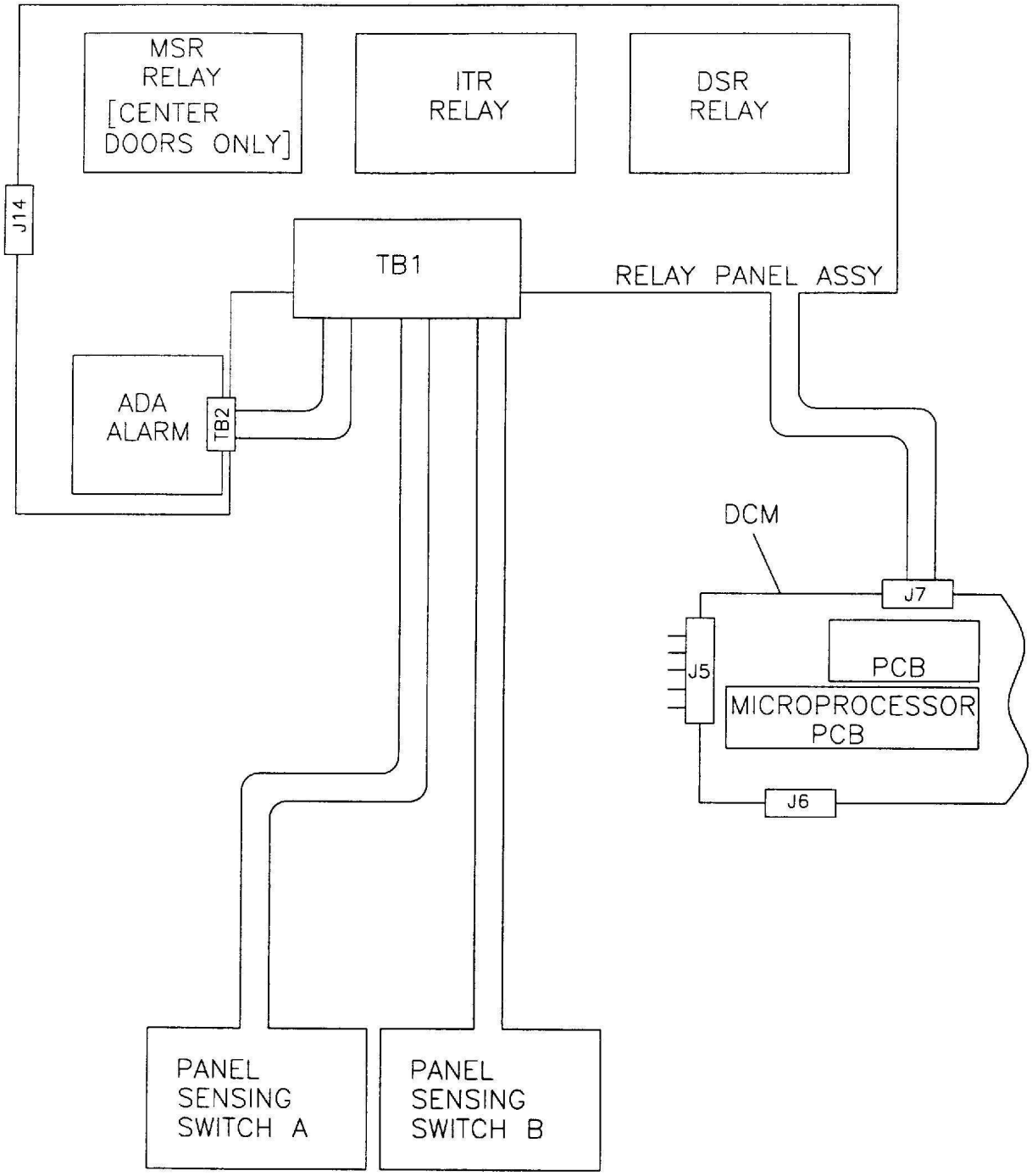


Figure 4-3.2 Door Control Interfaces (sheet 4 of 7)

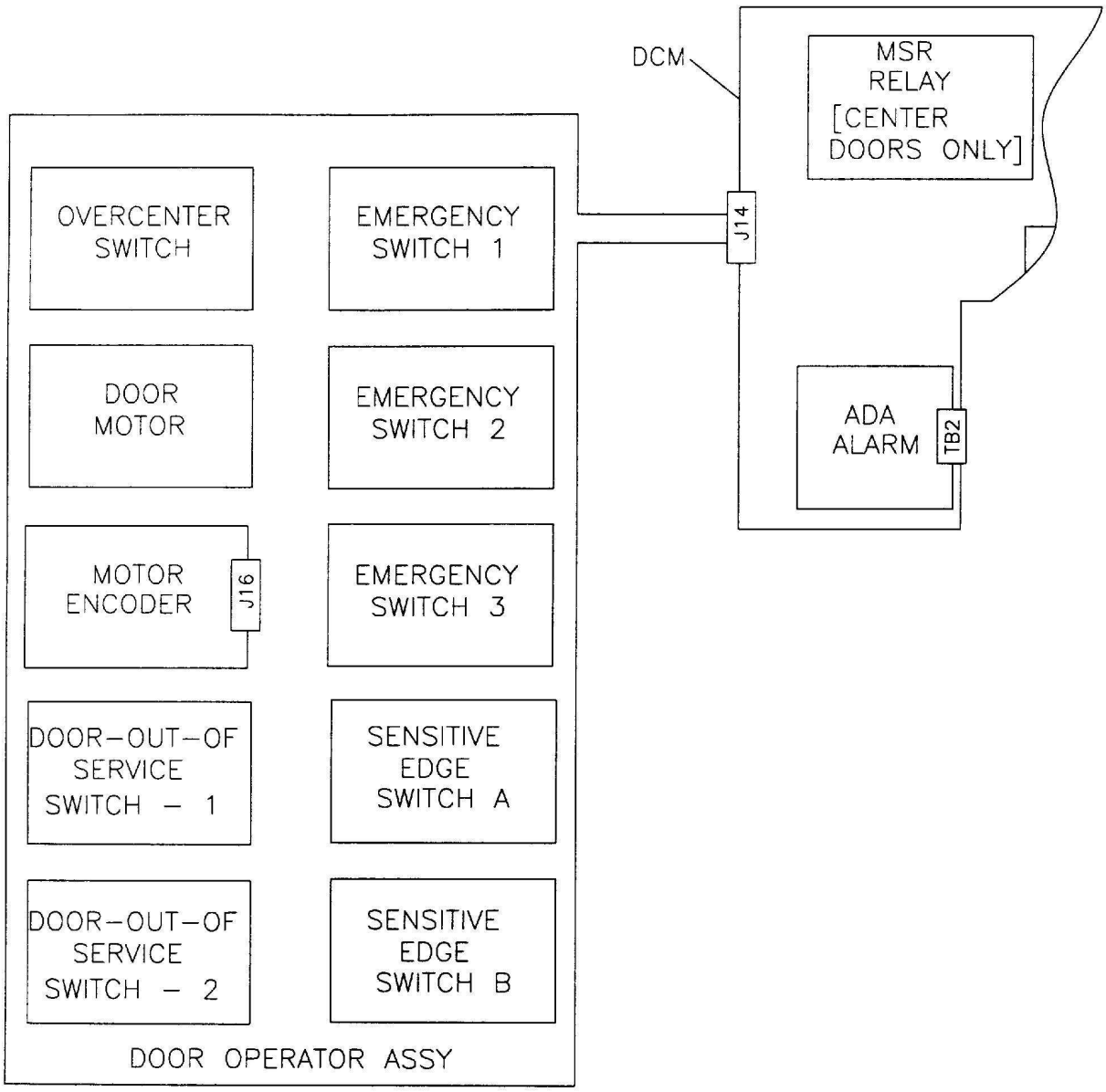


Figure 4-3.2 Door Control Interfaces (sheet 5 of 7)

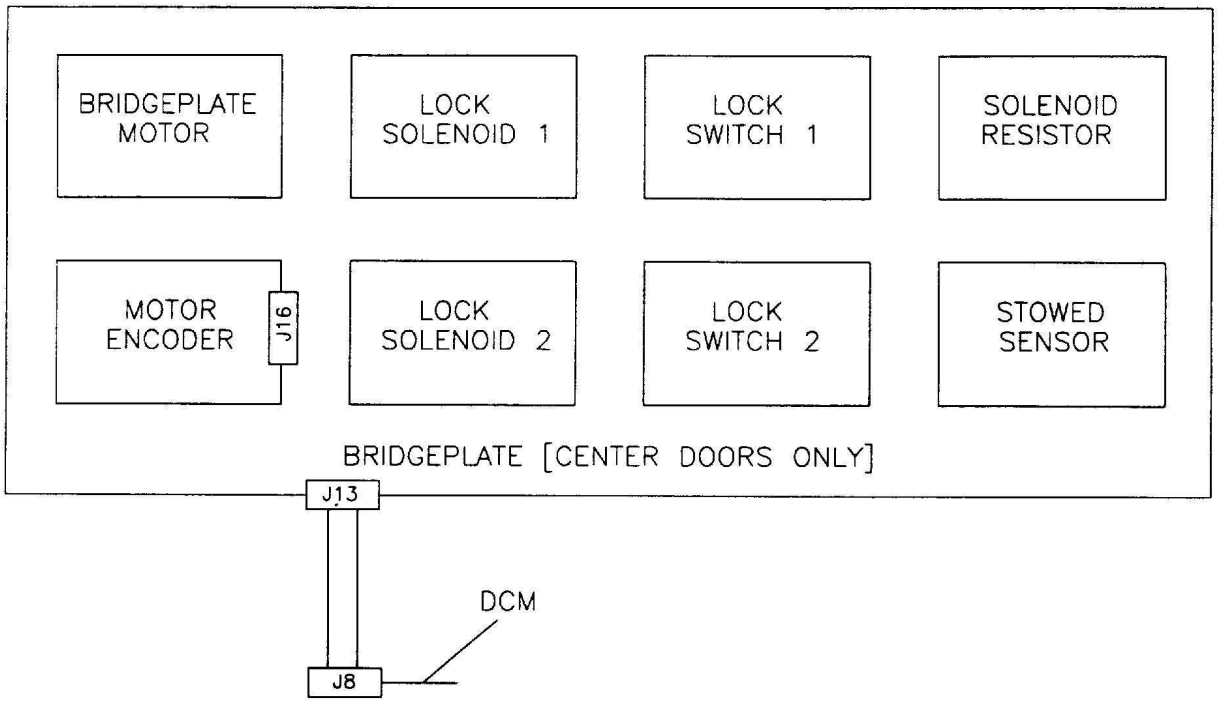


Figure 4-3.2 Door Control Interfaces (sheet 6 of 7)

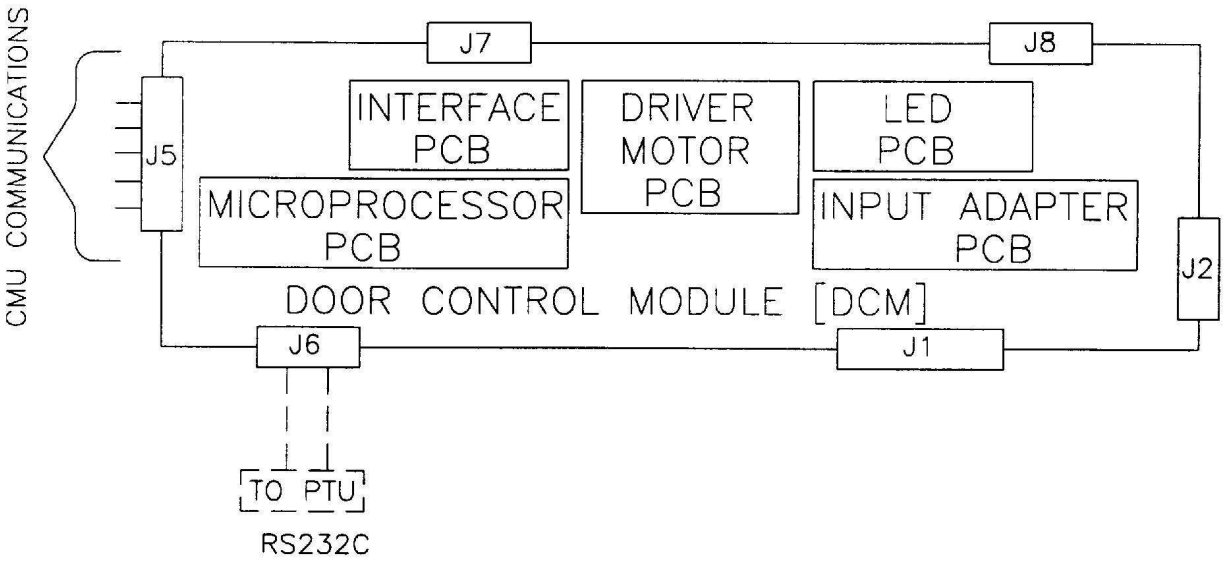


Figure 4-3.2 Door Control Interfaces (sheet 7 of 7)

a) Door Control Module Power Sources

1. During train operation, the DCM is powered with 37.5 VDC, nominal, from the train low voltage distribution network (LVDN).
2. During train operation, the DCM provides 15 VDC for sensors and switches and receives signals from them.
3. When the train is in layover the DCM is powered from the car battery circuit. Placing the car in layover also places the DCM in STAND-BY mode, which minimizes power requirements. When it is in STAND-BY mode, the DCM still responds to the exterior crew switch to open the crew door.

b) Trainlines

The trainlines provide information to the car control system, and request to the DCM. The trainlines also transmit door and bridgeplate status information to the car control system.

c) Door Operator Assembly

The DCM is connected to the door operator assembly, which is also connected to the carbody wiring and the by-pass contact for the door status interlock. The DCM provides operating commands to the door operator assembly, and receives door status information from the door operator assembly.

The door operator assembly is also connected directly to the carbody wiring, and provides the signal that applies the car brakes when the emergency door open handle is pulled.

d) Exterior Crew Switch

The DCM is the interface between the door operator and the exterior crew switches that are used by the crew to open and close the car end doors when the car is in layover mode.

e) Passenger Pushbutton

The passenger pushbuttons are located at the car doors having bridgeplates (A2, A3, B2 and B3). There is a pushbutton outside of each doorway and inside, in each vestibule area. When either the interior or exterior pushbutton is pressed, it alerts the train operator that the bridgeplate is required at that doorway.

The passenger pushbuttons have red and green LEDs that provide operational status information to the passengers. The green LEDs illuminate when the bridgeplate is requested. When the bridgeplate begins deployment, the green LEDs begin flashing, and continue flashing until the bridgeplate is stowed.

If the bridgeplate is by-passed by placing the BRIDGEPLATE OUT-OF-SERVICE switch on the controller to the OUT-OF-SERVICE position, the red LEDs on the switches are illuminated.

f) Annunciators

The DCM provides the commands to the annunciators, which include the door opening and closing warning light, the door closing audible alarm, the bridgeplate deployment and retraction warning alarm, and the out-of-service lamp. The operating annunciators operate only at doors that are opening or closing and with bridgeplate deployment or retraction, and do not operate at doors that are closed and locked. The DOOR OUT-OF-SERVICE lamp illuminates only at doors that are out of service.

g) Door Status Interlock

The DCM provides door status information to the operator's control station through the door status interlock.

h) Bridgeplate

The DCM is connected to the bridgeplate assembly. The DCM provides operating commands to the bridgeplate assembly, and receives bridgeplate status information from the bridgeplate assembly.

The DCM passes bridgeplate motor power to the bridgeplate through the BRIDGEPLATE OUT-OF-SERVICE BYPASS, a pair of switches mounted on the door operator. These switches allow the bridgeplate to be taken out of service. When the bridgeplate is by-passed, the out-of-service status is transmitted to the DCM.

i) Communications Module Unit

The communication module unit is part of the car control system. The communication between the DCMs and the communications module unit is through a shielded, three-wire RS-485 link. The tree wires are RS-485A wire, the RS-485B wire, and the isolated ground wire (ISO GND). Communications to and from the door operator controllers are through these lines. If a door is removed from service, communications for that door cease.

j) Test Interface

The DCM has an EIA RS-232 port for interface with a portable test unit. The portable test unit is computer based and has resident diagnostic software. The portable test unit is a diagnostic tool only, and monitors the door system performance while the door system is commanded and controlled from the operator's station or through the specific door passenger and crew switches.

k) Door Open Indicator

The DOOR OPEN indicator is commanded by the DCM. The indicator is illuminated whenever the door is UNLOCKED or LOCKED AND OPEN. Prior to the door beginning to close or the bridgeplate to retract, the DOOR OPEN indicator flashes for two seconds. This flashing signal is coordinated with the audible warning horn. After two seconds, the DOOR OPEN indicator returns to steady illumination until the bridgeplate has been retracted and the door is closed and locked.

l) Door Out-Of-Service Indicator

The DOOR OUT-OF-SERVICE indicator is commanded by the DCM. Moving the DOOR OUT-OF-SERVICE handle from the normal position the out-of-service position actuates the out-of-service switch, which provides a signal to the DCM. The DCM illuminates the DOOR OUT-OF-SERVICE indicator.

m) Doorway A1 and B1 Lights

The doorway lamps are commanded by the DCM. These lamps are illuminated whenever doors are not closed and locked.

4-3.b Specific Safety Precautions

WARNING:	**BEFORE PERFORMING DOORS AND BRIDGEPLATE ELECTRICAL SYSTEM MAINTENANCE PROCEDURES DISCONNECT ELECTRICAL POWER FROM VEHICLE BY SWITCHING OFF THE BATTERY CB (3Q03).**

4-3.c Fault/Isolation

The Doors and Bridgeplate Electrical System Fault Isolation/Repair, is included in Doors Fault Isolation/Repair procedure, refer to section 4-2.c

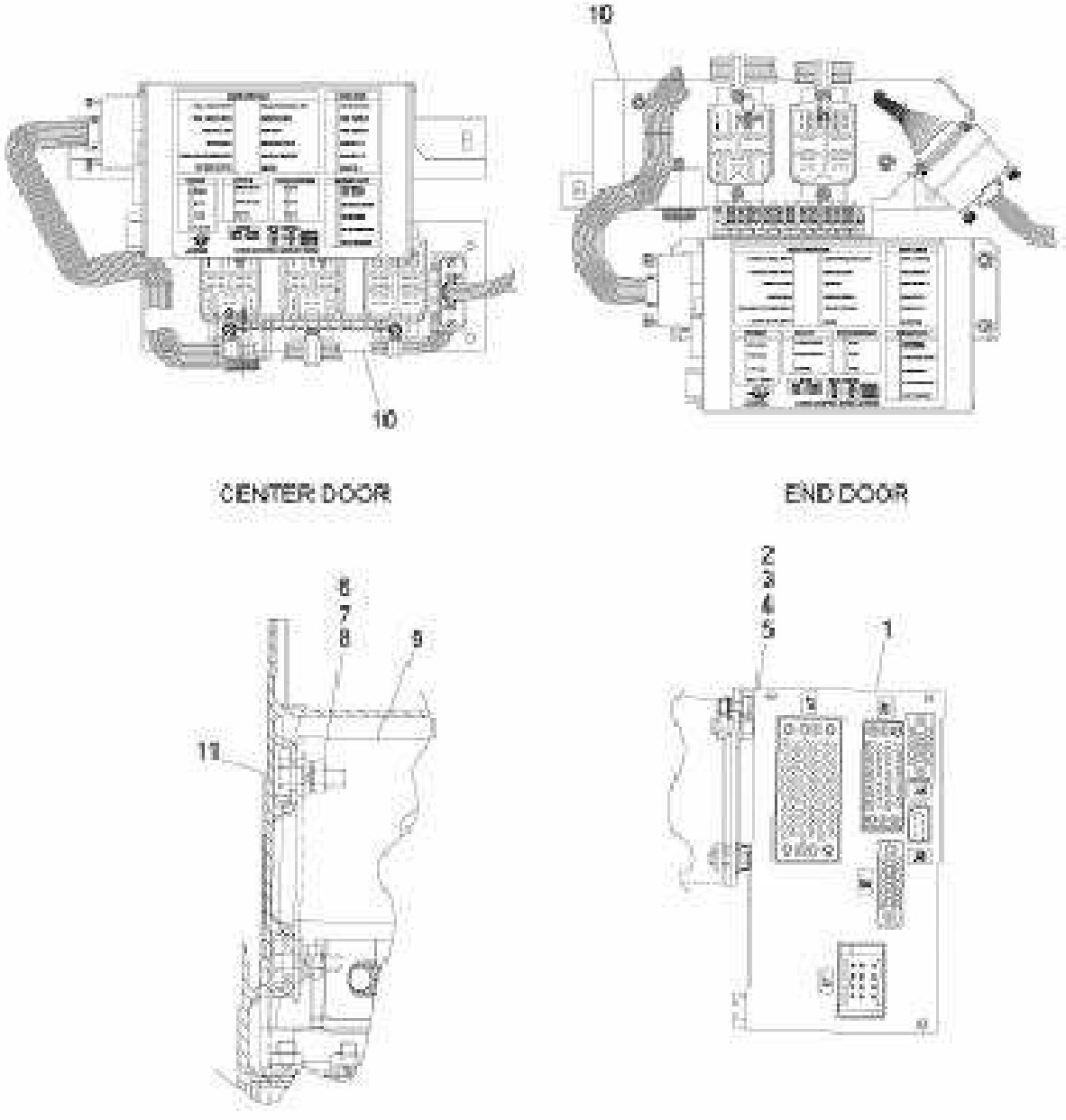


Figure 4-3.3 Controller, Relay Assembly, and Mounting Bracket

ITEM NO.	PART NAME	QTY	ITEM NO.	PART NAME	QTY
1	Door control module (Refer to Figure 4-12)	1	7	Lockwasher	4
2	Screw	4	8	Plain Washer	4
3	Lockwasher	4	9	Controller Mounting Bracket	1
4	Washer, Plain	4	10	Bracket and Relay Assembly (Refer to Figure 4-2.24 and Figure 4-2.25	1
5	Hex Nut	4	11	Mounting Bar	4
6	Hex Nut	4			

4-3.d Disassembly

- **Reference Information.**
  1. Tools/Equipment.
     – MBTA Overhaul Standard Tools Kit.
  2. Material (Not Applicable).
- **Procedure**

a) Removal

Refer to Figure 4-3.3. Controller, Relay Assembly, and Mounting Bracket. Remove the door control module, relay assembly, and mounting bracket as described below.

WARNING: SHUT OFF THE POWER TO THE DOOR CONTROL MODULE BEFORE DISCONNECTING THE TRAINLINE WIRING HARNESS AT THE DOOR CONTROL MODULE. LOCK OUT THE DISCONNECT AND POST "OUT OF SERVICE" AT THE LOCKOUT.

1. Disconnect the trainline wiring harness at the door control module (1).
2. Disconnect the door operator wiring harness at the door control module.
3. Remove four cap screws (2), lockwashers (3), washers (4), and hex nuts (5), and remove the door control module.

4. Remove four hex nuts (6), four lockwashers (7), and four plain washers (8), and remove the controller mounting bracket (9) and the relay assembly (10) from the car body.

5. Remove four mounting bars (11) from the car body by sliding them from their slots in the car body

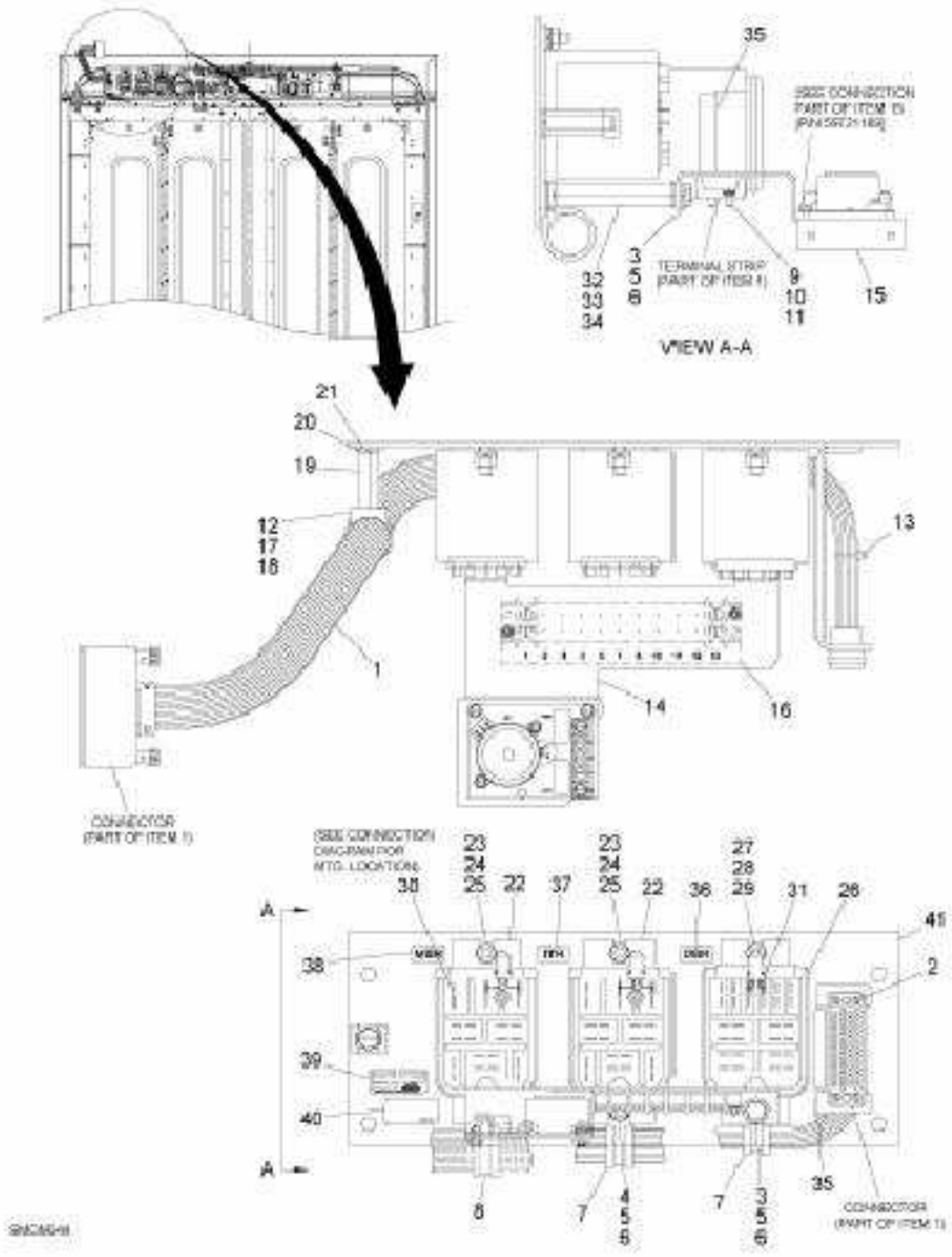


Figure 4-3.4. Relay Assembly, Center Doors

ITEM NO.	PART NAME	QTY	ITEM NO.	PART NAME	QTY
	Relay Assembly, Center Doors				
1	Wiring Harness	1	22	Critical Circuit Relay (MSR and ITR)	2
2	Screw	4	23	Hex Nut	2
3	Screw	2	24	Lockwasher	2
4	Hex Nut	1	25	Plain Washer	2
5	Lockwasher	3	26	Critical Circuit Relay (DSR)	1
6	Plain Washer	3	27	Hex Nut	1
7	Loop Clamp	2	28	Lockwasher	1
8	Loop Clamp	1	29	Plain Washer	1
9	Hex Nut	2	30	Faston Tab Cap	10
10	Lockwasher	2	31	Varistor Assembly	2
11	Plain Washer	2	32	Mounting Post	2
12	Harness Tie	2	33	Lockwasher	2
13	Harness Tie	5	34	Plain Washer	2
14	Mounting Bracket	1	35	Grommet	1
15	Bracket and PCB Assembly	1	36	Identification Label	1
16	Marker Strip	1	37	Identification Label	1
17	Screw	1	38	Identification Label	1
18	Tie Mount	1	39	Identification Label	1
19	Mounting Post	1	40	Identification Label	1
20	Lockwasher	1	41	Bracket Assembly	1
21	Plain Washer	1			

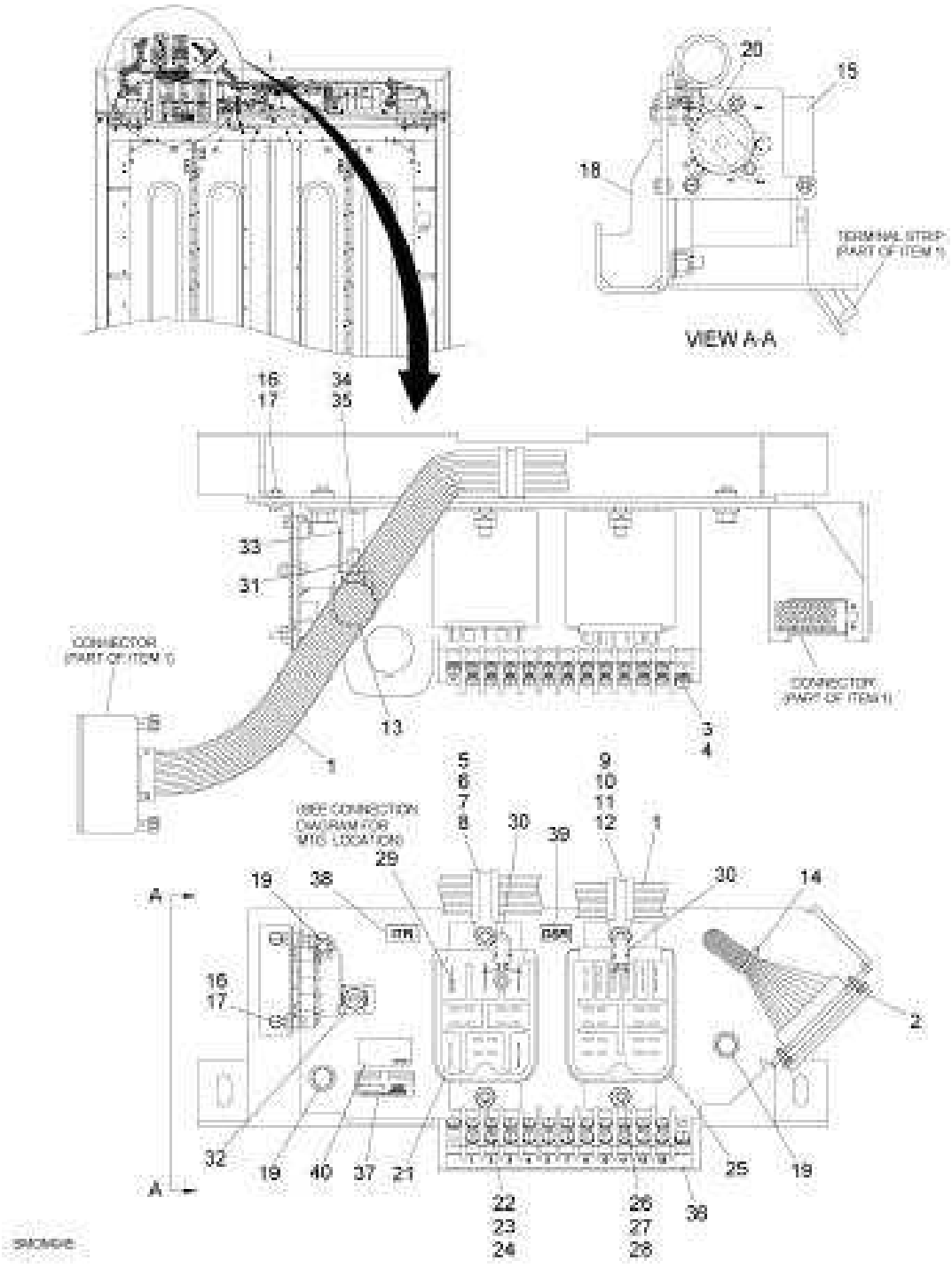


Figure 4-3.5. Relay Assembly, End Doors

ITEM NO.	PART NAME	QTY	ITEM NO.	PART NAME	QTY
	Relay Assembly, End Doors				
1	Wiring Harness	1	21	Critical Circuit Relay (ITR)	1
2	Screw	4	22	Plain Washer	1
3	Screw	2	23	Lockwasher	1
4	Hex Nut	1	24	Hex Nut	1
5	Loop Clamp	1	25	Critical Circuit Relay (DSR)	1
6	Plain Washer	1	26	Plain Washer	1
7	Lockwasher	1	27	Lockwasher	1
8	Hex Nut	1	28	Hex Nut	1
9	Loop Clamp	1	29	Faston Tab Cap	5
10	Plain Washer	1	30	Varistor Assembly	2
11	Lockwasher	1	31	Screw	1
12	Hex Nut	1	32	Tie Mount	1
13	Harness Tie	1	33	Mounting Post	1
14	Harness Tie	5	34	Lockwasher	1
15	Bracket and PCB Assembly	1	35	Plain Washer	1
16	Screw	2	36	Marker Strip	1
17	Lockwasher	2	37	Identification Label	1
18	Bracket Assembly	1	38	Identification Label (ITR)	1
19	Screw	3	39	Identification Label (DSR)	1
20	Mounting Plate	1	40	Identification Label	1

b) Disassembly

i) Center Door Relay Disassembly Instructions

Refer to Figure 4-3.4. Relay Assembly, Center Doors. Disassemble the relay assembly as described below.

1. Disconnect the main connector on the wiring harness (1). Do not cut and remove the harness ties (13) from the wiring harness unless the wiring harness is being repaired.
2. Remove two screws (3), one hex nut (4), three lockwashers (5), and plain washers (6) securing the loop clamps (7 and 8) to the bracket (41).

3. Remove two nuts (9), lockwashers (10), and plain washers (11) securing the connector to the bracket and board assembly (15). This frees the wiring harness (1).
4. If the marker strip (16) is damaged or illegible, remove it.
5. Remove the screw (17) and tie mount (18).
6. Remove the mounting post (19), lockwasher (20), and plain washer (21).
7. Remove two critical circuit relays (22) by removing two hex nuts (23), lockwashers (24), and plain washers (25).
8. Remove the critical circuit relay (26) by removing the hex nut (27), lockwasher (28), and plain washer (29).
9. Remove ten Faston tabs (30) from the critical circuit relays.
10. Remove three varistors (31) from the critical circuit relays.
11. Remove two mounting posts (32), lockwashers (33), and plain washers (34).
12. Remove the grommet (35) from the bracket (41).
13. Do not remove the identification labels (36, 37, 38, 39, and 40) unless they are damaged or illegible.

ii) End Door Relay Disassembly Instructions

(Refer to Figure 4-3.5, Relay Assembly, End Doors) Disassemble the relay assembly as described below.

1. Disconnect the main connector on the wiring harness (1).
2. Remove four screws (2) and free the wiring harness connector from the mounting plate (20).
3. Remove two screw (3) and hex nuts (4), which frees the wiring harness terminal strip.
4. Remove the hex nut (8), lockwasher (7), plain washer (6), and loop clamp (5).
5. Remove the hex nut (12), lockwasher (11), plain washer (10), and loop clamp (9).
6. Cut and remove the harness tie (13) securing the wiring harness (1) to the mounting post (33). This completes removal of the wiring harness. Do not cut and remove the harness ties (14) from the wiring harness unless the wiring harness is being repaired.
7. Remove screws (16) and lockwashers (17) to free the bracket and PCB assembly (15).

8. Remove three screws (19) and separate the bracket assembly (18) and mounting plate (20).
9. Remove the critical circuit relay (21) by removing the hex nut (24), lockwasher (23), and plain washer (22).
10. Remove the critical circuit relay (25) by removing the hex nut (28), lockwasher (27), and plain washer (26).
11. Remove five Faston tabs (29) from the critical circuit relays.
12. Remove two varistors (30) from the critical circuit relays.
13. Remove the screw (31) and tie mount (32).
14. Remove the mounting post (33), lockwasher (34), and plain washer (35).
15. If the marker strip (36) is damaged or illegible, remove it.
16. Do not remove the identification labels (37, 38, 39, and 40) unless they are damaged or illegible

4-3.e Cleaning/Painting

- **Reference Information.**
  1. Tools / Equipment.
     – MBTA approved Cleaning Tools / Equipment (commercial).
  2. Material.
     – MBTA approved Cleaning Products (commercial) (Refer to Section 1 Table 1-9).
- **Procedure.**

a) Cleaning

i) Cleaning of Electrical System Components

WARNING:	**BEFORE PERFORMING DOORS AND BRIDGEPLATE ELECTRICAL SYSTEM CLEANING PROCEDURE DISCONNECT ELECTRICAL POWER FROM VEHICLE BY SWITCHING OFF THE BATTERY CB (3Q03).**

To Clean Doors and Bridgeplate Electrical System Components proceed as follows:

Set the Vehicle in safety condition in accordance with MBTA Carhouse Regulations.

– Switch OFF the Battery Circuit Breaker (CB 3Q03 – Battery Box).

Clean the exterior of the controller with a dry, lint-free cloth. Wipe the surface free of accumulated dust.

Where practical, clean the surface of the relays and electrical harness with a dry, lint-free cloth. If necessary, clean confined areas with a soft-bristled brush and a vacuum cleaner.

Clean the Door Operator switches and their electrical connections with a soft-bristled brush and a vacuum cleaner.

Where practical, clean the surfaces of the door out-of-service assembly with a dry, lint-free cloth. If necessary, clean confined areas with a soft-bristled brush and a vacuum cleaner.

Where practical, clean the surface of the gearbox and its related components with a dry, lint-free cloth. If necessary, clean the surface of the gearbox with a lint-free cloth moistened with a non-volatile, residue free solvent.

Clean the surface of the door operator motor with a lint-free cloth. If necessary, clean the surface of the motor with a lint-free cloth moistened with a non-volatile, residue free solvent.

Clean the surfaces of the door operating rods, the levers, and the channels with a solvent moistened, lint-free cloth.

ii) Cleaning of Controller and Relay Assembly Component

1. Clean the controller and relay assembly components to allow inspection as defined in Table 4-2.1, below.
2. After cleaning, protect all components from corrosion. Inspect them as soon as possible, and after inspection, apply a light coat of protective oil to all ferrous parts that are not corrosion protected with plating or black oxide.

Table 4-3.1. Controller and Relay Assembly Cleaning Instructions

FIGURE AND ITEM	PART NAME	CLEANING METHODS AND MATERIALS
Figure 4-3.3-1	Door control module	Door Control Module Components Cleaning Instructions.
-9	Mounting bracket	Clean with a nonvolatile, residue free solvent; air blow dry.
-11	Mounting bar	
Figure 4-3.4-1	Wiring harness	Clean with a mild soap and water solution, or with a non-reacting solvent on clean, lint-free cloths. Do not allow the soap and water solution or the solvent to get inside the wiring bundle or into the connectors.

-14	Bracket	Clean with a nonvolatile, residue free solvent; air blow dry.
-15	Bracket and PCB Assembly	Clean with dry, low pressure air, a soft bristled brush, and lint-free cloths. Do not use solvents.
-18	Tie mount	Clean with a nonvolatile, residue free solvent; air blow dry.
-19	Mounting post	
-22	Circuit relay	Clean with dry, low pressure air, a soft bristled brush, and lint-free cloths. Do not use solvents.
-26	Circuit relay	
-32	Mounting post	Clean with a nonvolatile, residue-free solvent; air blow dry.
-41	Bracket assembly	
Figure 4-3.5-1	Wiring harness	Clean with a mild soap and water solution, or with a non-reacting solvent on clean, lint-free cloths. Do not allow the soap and water solution or the solvent to get inside the wiring bundle or into the connectors.
-15	Bracket and PCB Assembly	Clean with dry, low pressure air, a soft bristled brush, and lint-free cloths. Do not use solvents.
-18	Bracket assembly	Clean with a nonvolatile, residue free solvent; air blow dry.
-20	Mounting plate	
-21	Circuit relay	Clean with dry, low pressure air, a soft bristled brush, and lint-free cloths. Do not use solvents.
-25	Circuit relay	
-32	Tie mount	Clean with a nonvolatile, residue free solvent; air blow dry.
-33	Mounting post	

b) Painting (Not Applicable)

4-3.f Inspection

- **Reference Information.**
  1. Tools/Equipment (Not Applicable).
     – MBTA Carhouse Standard Tools Kit.
  2. Material (Not Applicable).
- **Procedure.**

i) Inspection of Electrical System Components

WARNING:	**BEFORE PERFORMING DOORS AND BRIDGEPLATE ELECTRICAL SYSTEM INSPECTION PROCEDURE DISCONNECT ELECTRICAL POWER FROM VEHICLE BY SWITCHING OFF THE BATTERY CB (3Q03).**

Procedure.

To Inspect Doors and Bridgeplate Electrical System Components proceed as follows:

Set the Vehicle in safety condition in accordance with MBTA Carhouse Regulations.

- Switch OFF the Battery Circuit Breaker (CB 3Q03 – Battery Box).

General Inspection Instructions

The inspection terms are defined below.

Visual inspection means examining the components for visible signs of damage or deterioration.

- Mechanical damage is defined as:
- Corrosion
- Erosion
- Deformation
- Cracking and Chipping
- Wear
- Overheating, as indicated by heat discoloration.

Electrical damage and deterioration is defined as:

- Overheat damage, as evidenced by discolored insulation on wiring, discolored electronic components, discolored conformal coating on the printed circuit boards, and discolored or blistered paint on components such as motors and solenoids;
- Arcing damage, as evidenced by blackening and charring at electrical connections, and as blackened, charred areas on insulation;
- Deterioration, as evidenced by cracks in insulation, brittle insulation, cracks or chips in electronic components or leads.

Inspect the Exterior Crew Switch Cover for damage and deformation, replace if necessary.

Inspect the Exterior Crew Switch Hinge Spring. If the hinge spring not hold the cover tight to the switch body, replace the switch cover.

Inspect the switch for damage and deformation, replace if necessary.

Inspect Bridgeplate Request Pushbutton for damage, replace if necessary.

Inspect the Interior Crew Switch for damage, replace if necessary.

Inspect the Controller and Relay Assembly for physical damage, replace if necessary.

Inspect the Controller and Relay Wiring Harness for damage to the insulation and overheating, as evidenced by discoloration, replace if necessary.

Inspect all Wiring and Connections for evidence of arcing, which appears as blackened and charred connections and blackened areas on the wiring. If there is charring at a connection, replace the connection and the mating harness.

Inspect all Electrical Connections, tightening loose connections. If a secure connection cannot be obtained, replace connector/connection.

Inspect all lamps turn on and flash when required. Replace as described in the related para of the Section 6 of this manual.

Inspection results must be recorded on Defect Report Cards to allow the planning of Maintenance Operations.

ii) Inspection of Controller and Relay Assembly Component

Inspect the door controller and relay assembly components according to the specific instructions provided in Table 4-3.2, below.

Table 4-3.2. Controller and Relay Assembly Inspection Methods and Criteria

FIGURE AND ITEM	PART NAME	INSPECTION METHODS AND CRITERIA
Figure 4-3.4-1	Wiring harness	Visually inspect for damage and deformation. Inspect all electrical terminations for signs of arcing and overheating. Inspect the insulation for evidence of age deterioration, and for discoloration, which indicates overheating. Inspect the connectors for loose, bent, or missing pins, and for secure wire connections.
-14	Bracket	Visually inspect for deformation, corrosion, excessive wear, and damage; replace as necessary.
-15	Bracket and PCB assembly	Visually inspect for damage and deformation. Inspect the PCB components for signs of arcing and overheating. Inspect the insulation for evidence of age deterioration, and for discoloration, which indicates overheating.
-22	Circuit relay	Visually inspect for damage and deformation, and inspect all electrical terminations for signs of arcing or overheating.
-26	Circuit relay	
-41	Bracket assembly	Visually inspect for deformation, corrosion, excessive wear, and damage; replace as necessary.
Figure 4-3.5-1	Wiring harness	Visually inspect for damage and deformation. Inspect all electrical terminations for signs of arcing and overheating. Inspect the insulation for evidence of age deterioration, and for discoloration, which indicates overheating. Inspect the connectors for loose, bent, or missing pins, and for secure wire connections.
-15	Bracket and PCB assembly	Visually inspect for damage and deformation. Inspect the PCB components for signs of arcing and overheating. Inspect the insulation for evidence of age deterioration, and for discoloration, which indicates overheating.
-18	Bracket	Visually inspect for deformation, corrosion, excessive wear, and damage; replace as necessary.
-20	Mounting plate	
-21	Circuit relay	Visually inspect for damage and deformation, and inspect all electrical terminations for signs of arcing or overheating.
-25	Circuit relay	

4-3.g Repair (Not Applicable)

4-3.h Reassembly

- **Reference Information.**
  1. Tools / Equipment.
     – MBTA Overhaul Standard Tools Kit.
  2. Material (Not Applicable).
- **Procedure**

a) Reasssembly

i) Center Door Relay Reassembly

Refer to Figure 4-3.4. Relay Assembly, Center Doors. Assemble the center door relay assembly as described below.

1. Install the grommet (35).
2. Install two plain washers (34) and two lockwashers (33) on the studs on the bracket assembly (41). Turn the mounting posts (32) onto the studs, tightening the posts to 7 ± 1 foot pounds.
3. Install one varistor (31) on each of three critical circuit relays (26 and 22).
4. Install 10 Faston tabs (30) on the critical circuit relays (26 and 22).
5. Install the critical circuit relay (26) as described below.
6. Place the relay over its mounting posts on the mounting plate.
7. Place one plain washer (29) and one lockwasher (28) on the post. Install one hex nut (27) on the post. Tighten the nut to 7 ± 1 foot pounds.
8. Reconnect the wires to the relay
9. Install the critical circuit relays (22) as described below.
10. Place the relays over their mounting posts on the mounting plate.
11. Place one plain washer (25) and one lockwasher (24) on each post. Install one hex nut (23) on each post. Tighten the nuts to 7 ± 1 foot pounds.
12. Reconnect the wires to the relays. Make sure the wires are connected as tagged at removal.
13. Install one plain washer (21), one lockwasher (20), and the mounting post (19) on the bracket assembly. Tighten the mounting post to 7 ± 1 foot pounds.
14. Install the tie mount (18) and mounting screw (17). Tighten the screw to 7 ± 1 foot pounds.

15. If the marker strip (16) was removed, clean the marker strip area of any adhesive. Place the marker strip and press it in place.
16. Position and secure the bracket and board assembly (15) with its own mounting hardware.
17. Install the wiring harness (1) as described below.
18. Route the wiring harness on the relay assembly bracket (41).
19. Position the connector and terminal strip.
20. Secure the connector with four screws (2). Tighten the screws to 7 ± 1 inch pounds.
21. Secure the terminal strip with two plain washers (11), lockwashers (10), and hex nuts (9). Tighten the nuts to 13 ± 1 inch pounds.
22. Install the loop clamps (7 and 8). Secure the loop clamps using three plain washers (6) and lockwashers (5), two screws (3), and one hex nut (4). Tighten the screws and nut to 7 + 1 foot pounds.
23. Connect the wires removed from the terminal strip. Make sure the wires are reconnected as tagged at removal.
24. Attach the wiring harness to the mounting post (19) with harness tie (12).
25. Reconnect the wiring harness main connector.

ii) End Door Relay Reassembly

Refer to Figure 4-3.5. Relay Assembly, End Doors. Assemble the end door relay assembly as described below.

1. If the marker strip (36) was removed, clean the marker strip area of any adhesive. Place the marker strip and press it in place.
2. Install one plain washer (35) and lockwasher (34) on the stud on the bracket assembly (18). Turn the mounting post (33) onto the stud, tightening the post to 7 ± 1 foot pounds.
3. Install one varistor (30) on each of the critical circuit relays (25 and 21).
4. Install five Faston tabs (29) on the critical circuit relays (25 and 21).
5. Install the critical circuit relay (25) as described below.
    a. Place the relay over its mounting posts on the mounting plate.
    b. Place one plain washer (26) and one lockwasher (27) on the post. Install one hex nut (28) on the post. Tighten the nut to 7 ± 1 foot pounds.
    c. Reconnect the wires to the relay.
6. Install the critical circuit relay (21) as described below.

a. Place the relay over its mounting posts on the mounting plate.

b. Place one plain washer (22) and one lockwasher (23) on the post. Install one hex nut (24) on the post. Tighten the nut to 7 ± 1 foot pounds.

c. Reconnect the wires to the relay. Make sure the wires are connected as tagged at removal.

7. Mount the bracket assembly (18) on the mounting plate (20) using three screws (19). Tighten the screws to 7 ± 1 foot pounds.

8. Mount the bracket and PCB assembly (15) to the mounting plate (20) using two screws (16) and lockwashers (17). Tighten the screws to 13 ± 1 inch pounds.

9. Install the wiring harness (1) as described below.

a. Route the wiring harness on the mounting plate (20).

b. Position the connector and terminal strip.

c. Secure the connector with four screws (2). Tighten the screws to 7 ± 1 inch pounds.

d. Secure the terminal strip with two screws (3) and hex nuts (4). Tighten the nuts to 13 +1 inch pounds.

e. Install the loop clamps (5 and 9). Secure the loop clamps using plain washers (6 and 10), lockwashers (7 and 11), and hex nuts (8 and 12). Tighten the nuts to 7 ± 1 foot pounds.

f. Connect the wires removed from the terminal strip. Make sure the wires are reconnected as tagged at removal.

10. Attach the wiring harness to the mounting post (33) with harness tie (13).

11. Reconnect the wiring harness main connector.

b) Installation

Refer to Figure 4-3.3. Controller, Relay Assembly, and Mounting Bracket. Install the door control module, relay assembly, and mounting bracket as described below.

1. Place the mounting bars (11) in their positions on the car structure.

2. Position the mounting bracket (9) over the studs on the mounting bars, and secure the mounting bracket and bracket and relay assembly (10) with four plain washers (8), lockwashers (7), and hex nuts (6).

3. Place the door control module (1) at the overhead bracket. Holding the door control module in position, install four lockwashers (3) and four plain

washers (4) on four screws (2). Insert the screws through the mounting feet, and install four hex nuts (5). Tighten the hex nuts.

4. Reconnect the door operator wiring harness to the controller and relay bracket assembly wiring harness.

5. Reconnect the trainline wiring harness to the controller and relay bracket assembly wiring harness.

4-3.i Adjustment/test

a) Adjustment

i) Adjustment of Electrical System Components

WARNING:	**BEFORE PERFORMING DOORS AND BRIDGEPLATE ELECTRICAL SYSTEM ADJUSTMENT PROCEDURE DISCONNECT ELECTRICAL POWER FROM VEHICLE BY SWITCHING OFF THE BATTERY CB (3Q03).**

ADJUSTMENT OF THE DOOR SYSTEM SWITCHES

To Adjust Door System Switches proceed as follows:

Set the Vehicle in safety condition in accordance with MBTA Carhouse Regulations.

– Switch OFF the Battery Circuit Breaker (CB 3Q03 – Battery Box)

Loosen the fasteners that lock the switch mounting plate in place. Back the switch away from contact with the switch actuating cam.

Move the cam that contact the switch actuator to the actuated position.

Place a 0.015 in. feeler gauge between the actuating cam and the switch actuator. Carefully push the switch on its mounting plate toward the cam until the switch actuates. Continue to move the switch toward the cam until the switch bottoms. With the switch mounting plate held in position, tighten the switch mounting plate fasteners to the torque value appropriate for the fastener. This provides 0.015 in. switch cam overtravel before the switch cam will bottom.

ii) Adjustment of Controller and Relay Assembly Component

No adjustment of the door control module, relay assembly, and mounting bracket are required after installation.

a) Test

i) Test of Electrical System

The Door and Bridgeplate Electrical System Test, is included in Doors System Test procedure, refer to section 4-2.i b

ii) Bench Test

There are no bench test procedures for the door control module, relay assembly, and mounting bracket.

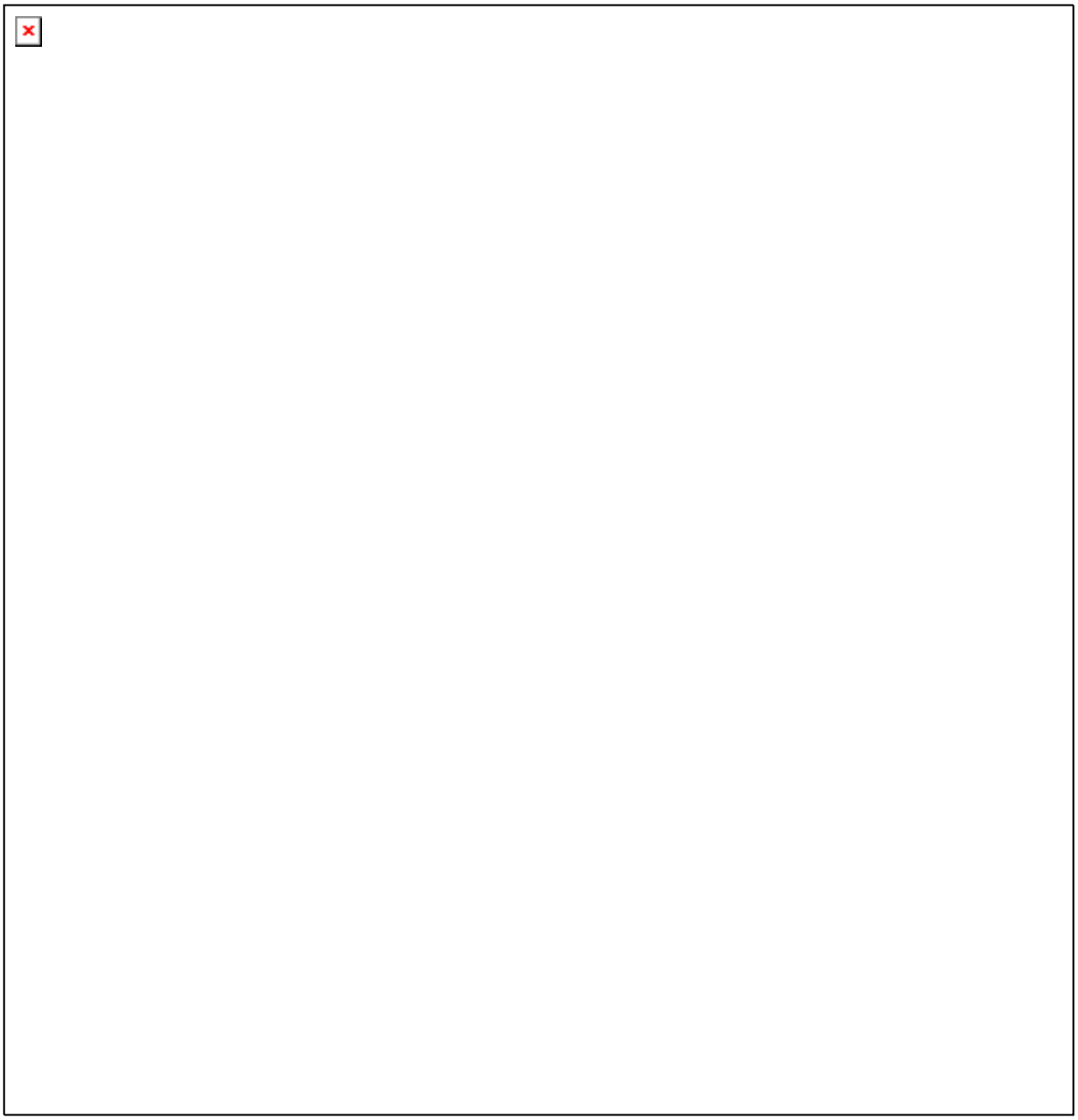


Figure 4-3.6. Door Control Module Sheet 1 of 2)

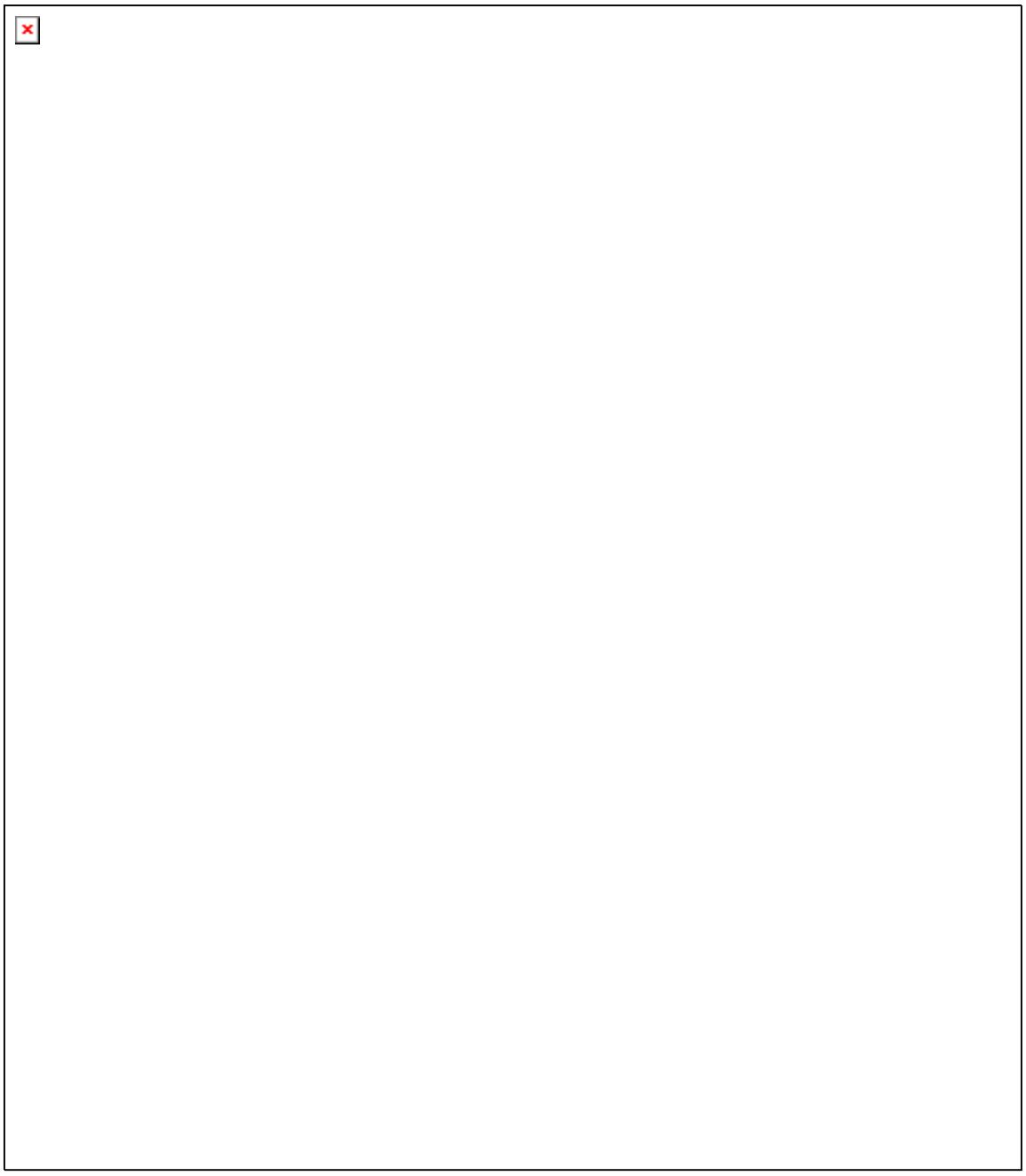


Figure 4-3.6. Door Control Module (Sheet 2 of 2)

4-4 Doors and Bridgeplates Controls and Indicators

4-4.a Description and Operation

The Doors and Bridgeplates Controls and Indicators are located as follows:

- Operator Console - Controls and Indicators (Refer to para 4-4.1):
  - DOOR CONTROL LEFT – REAR OPEN/CLOSE Switch.
  - DOOR CONTROL LEFT – CENTER OPEN/CLOSE Switch.
  - DOOR CONTROL RIGHT – CENTER OPEN/CLOSE Switch.
  - DOOR CONTROL RIGHT – FRONT OPEN/CLOSE Switch.
  - DOOR CLOSED Indicator Light.
- Passenger Compartment - Controls and Indicators (Refer to para 4-4.2):
  - Bridgeplate/Door Crew Key Switch.
  - Bridgeplate Request Pushbutton.
  - Passenger Emergency Stop Handle.
  - Passenger Stop Request Tape Switch Handle.
  - Manual Emergency Release Handle.
  - Door OUT-OF-SERVICE Handle.
  - Door OPEN/CLOSE Warning Light.
  - Door OUT-OF-SERVICE Indicator Light.
  - Bridgeplate Acoustic Alarm.
  - Door Warning Acoustic Alarm.
- External Vehicle - Controls and Indicators (Refer to para 4-4.3):
  - Door Crew Key Switch.
  - Bridgeplate/Door Crew Key Switch.
  - Bridgeplate Request Pushbutton.
  - External Emergency Door Release Handle.
  - Door OPEN/CLOSE Warning Light.
  - Door OUT-OF-SERVICE Indicator Light.

4-4.1 Operator Console - Controls and Indicators

4-4.1.a Description and Operation

The Door Control System includes several controls and indicator installed on the Operator Console as follows (Refer to Figure 4-4.1):

- DOOR CONTROL LEFT – REAR OPEN/CLOSE Switch (green) (8S02). It is a three positions momentary switch (spring loaded to center position). It controls the operation of the left rear door.
- DOOR CONTROL LEFT – CENTER OPEN/CLOSE Switch (green) (8S04). It is a three positions momentary switch (spring loaded to center position). It controls the operation of the left center doors.
- DOOR CONTROL RIGHT – CENTER OPEN/CLOSE Switch (green) (8S05). It is a three positions momentary switch (spring loaded to center position). It controls the operation of the right center doors.
- DOOR CONTROL RIGHT – FRONT OPEN/CLOSE Switch (green) (8S03). It is a three positions momentary switch (spring loaded to center position). It controls the operation of the right front door.
- DOOR CLOSED Indicator Light (green). It turns on when all door are closed, locked, and all bridgeplates are stowed.

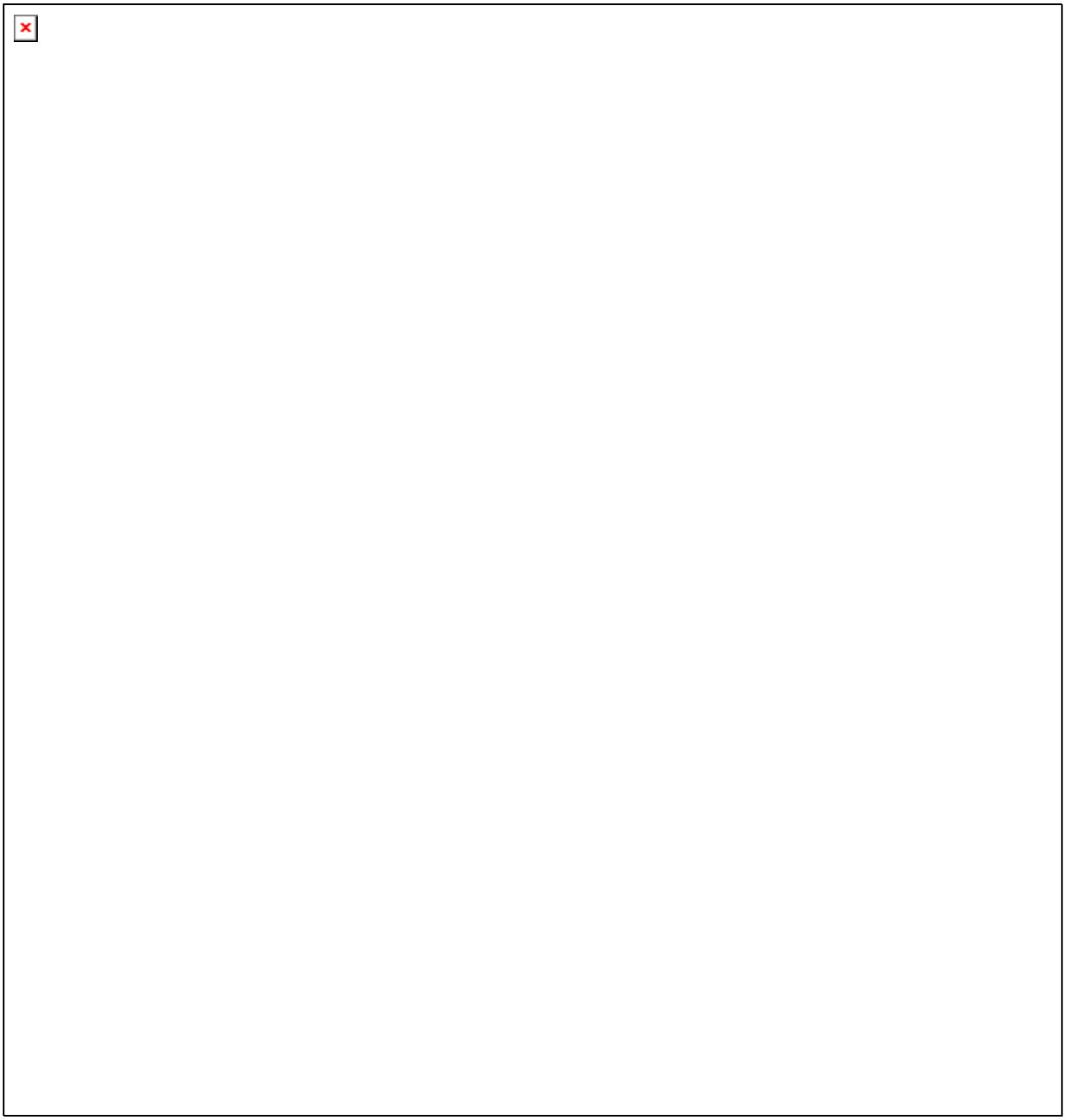


Figure 4-4.1 Operator Console - Controls and Indicators Location

4-4.1.b Specific Safety Precautions (Not Applicable)

4-4.1.c Fault/Isolation

The Operator Console - Controls and Indicators Fault Isolation/Repair, is included in Doors Fault Isolation/Repair procedure, refer to section 4-2.c.

4-4.1.d Disassembly (Not Applicable)

4-4.1.e Cleaning/Painting

- **Reference Information.**
  1. Tools/Equipment.
     – MBTA approved Cleaning Tools / Equipment (commercial).
  2. Material.
     – MBTA approved Cleaning Products (commercial) (Refer to Section 1 Table 1-9).
- **Procedure.**

a) Cleaning

The Operator Console - Controls and Indicators Cleaning, is included in the Operator Console Cleaning procedure, refer to Section 7 of MM.

b) Painting (Not Applicable)

4-4.1.f Inspection

- **Reference Information.**
  1. Tools/Equipment (Not Applicable).
     – MBTA Carhouse Standard Tools Kit.
  2. Material (Not Applicable).
- **Procedure.**

The Operator Console - Controls and Indicators Cleaning, is included in the Operator Console Inspection procedure, refer to Section 7 of this manual.

4-4.1.g Repair (Not Applicable)

4-4.1.h Reassembly (Not applicable)

4-4.1.i Adjustment/Test

a) Adjustment (Not Applicable)

b) Test

The Operator Console - Controls and Indicators Test, is included in Doors Test procedure, refer to section 4-2.i. b).

4-4.2 Passenger Compartment - Controls and Indicators

4-4.2.a Description and Operation

The Passenger Compartment - Controls and Indicators includes the following controls and indicators (Refer to Figure 4-4.2 for components location):

- Bridgeplate/Door Crew Key Switch.
- Bridgeplate Request Pushbutton.
- Passenger Stop Request Tape Switch.
- Manual Emergency Door Release Handle.
- Passenger Emergency Stop Handle.
- Door OUT-OF-SERVICE Handle.
- Bridgeplate Acoustic Alarm.
- Door Warning Acoustic Alarm.
- Door OPEN/CLOSE Warning Light.
- Door OUT-OF-SERVICE Indicator Light.

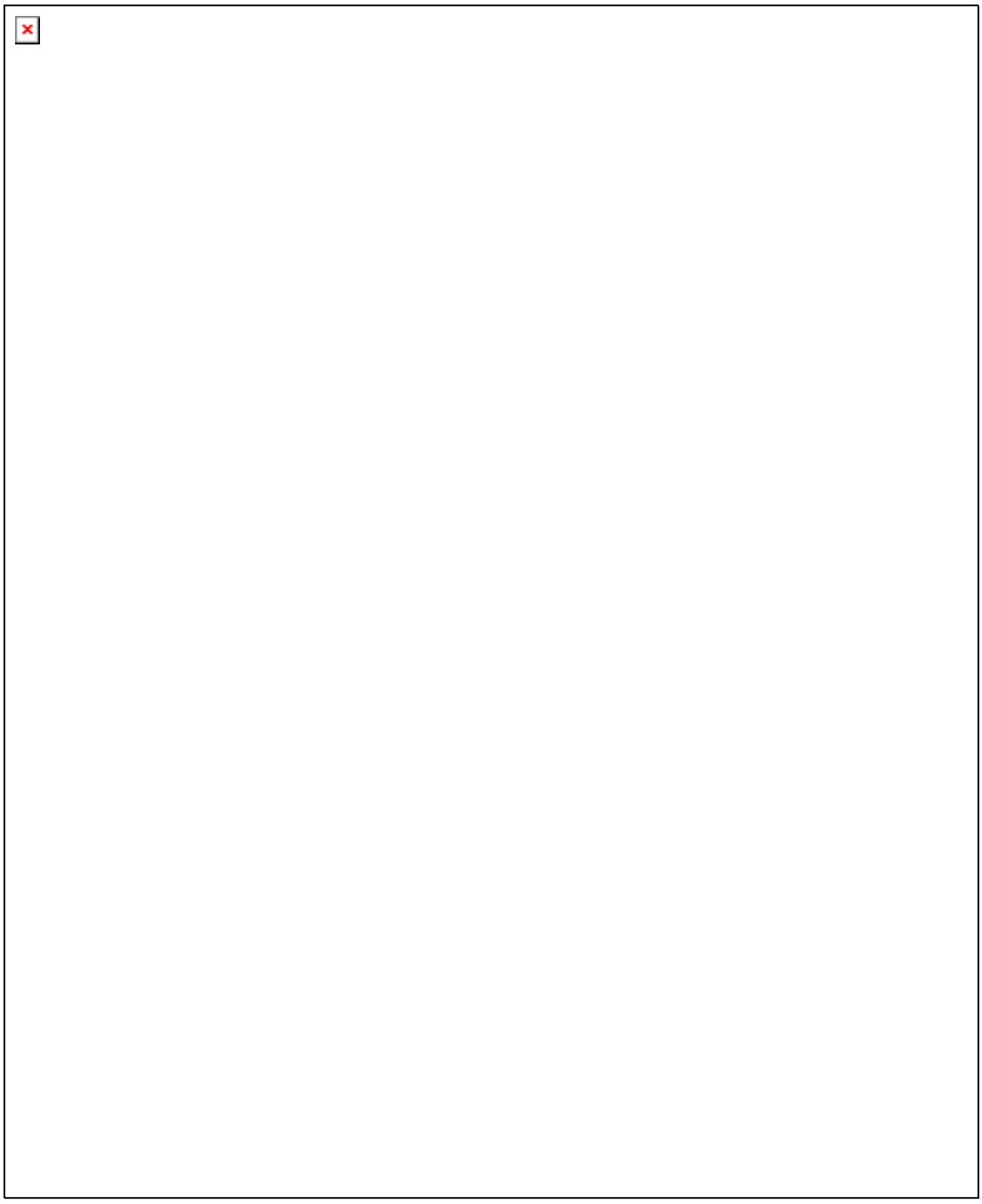


Figure 4-4.2 Passenger Compartment - Controls and Indicators Location (Sheet 1 of 5)

Figure 4-4.2 Passenger Compartment - Controls and Indicators Location (Sheet 2 of 5)

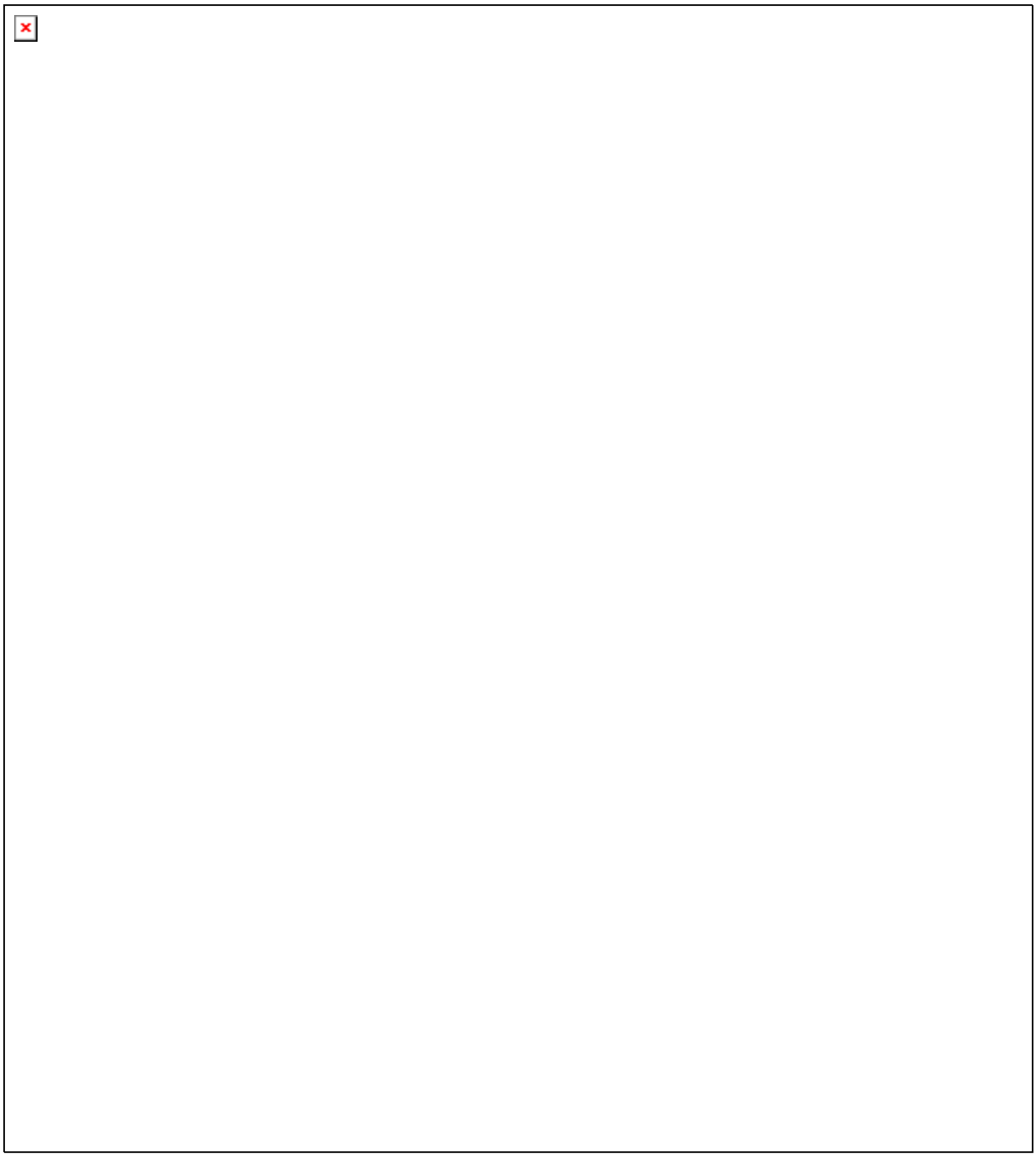


Figure 4-4.2 Passenger Compartment - Controls and Indicators Location	(Sheet 3 of 5)

Figure 4-4.2 Passenger Compartment - Controls and Indicators Location (Sheet 4 of 5)

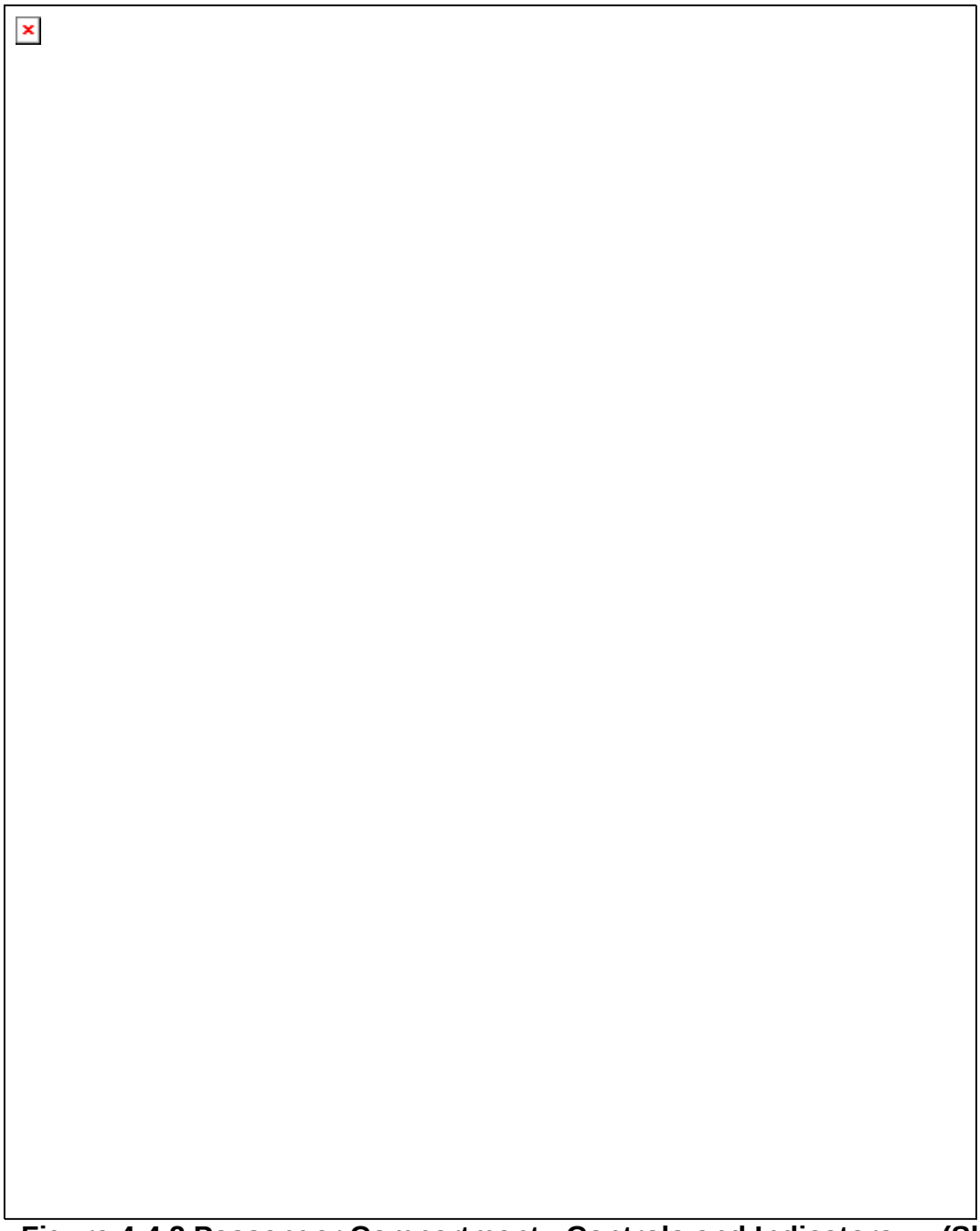


Figure 4-4.2 Passenger Compartment - Controls and Indicators Location (Sheet 5 of 5)

4-4.2.b Specific Safety Precautions

Since the Passenger Compartment - Controls and Indicators consist of separate items, the Specific Safety Precautions are described in the para(s) related to each item.

4-4.2.c Fault/Isolation

Since the Passenger Compartment - Controls and Indicators consist of separate items, the Fault Isolation / Repair are described in the para(s) related to each item, as shown in Table 4-4.1

Table 4-4.1 Passenger Compartment - Controls and Indicators -Fault Isolation / Repair

COMPONENTS	FAULT ISOLATION REFERENCE (Para)
Bridgeplate/Door Crew Key Switch	4-4.2.1.c
Bridgeplate Request Pushbutton	4-4.2.2.c
Passenger Stop Request Tape Switch	Refer to Section 7 of MM
Manual Emergency Door Release Handle	4-4.2.4.c
Passenger Emergency Stop Handle	4-4.2.5.c
Door OUT-OF-SERVICE Handle	4-4.2.6.c
Bridgeplate Acoustic Alarm	TBD
Door Warning Acoustic Alarm	TBD
Door OPEN / CLOSE Warning Light	Refer to Section 6 of MM
Door OUT-OF-SERVICE Indicator Light	Refer to Section 6 of MM

4-4.2.d Disassembly

- **Reference Information.**
  1. Tools / Equipment.
     – MBTA Overhaul Standard Tools Kit.
  2. Material (Not Applicable).

  Since the Passenger Compartment - Controls and Indicators consist of separate items, the Removal is described in the para(s) related to each item, as shown in Table 4-4.2

Table 4-4.2 Passenger Compartment - Controls and Indicators - Disassembly

COMPONENTS	DISASSEMBLY REFERENCE (Para)
Bridgeplate/Door Crew Key Switch	4-4.2.1.d
Bridgeplate Request Pushbutton	4-4.2.2.d
Passenger Stop Request Tape Switch	Refer to Section 7 of MM
Manual Emergency Door Release Handle	Refer to Section 4 of this manual
Passenger Emergency Stop Handle	4-4.2.5.d
Door OUT-OF-SERVICE Handle	Refer to Section 4 of this manual
Bridgeplate Acoustic Alarm	TBD
Door Warning Acoustic Alarm	TBD
Door OPEN / CLOSE Warning Light	Refer to Section 6 of this manual
Door OUT-OF-SERVICE Indicator Light	Refer to Section 6 of this manual

4-4.2.e Cleaning/Painting

- **Reference Information.**
  1. Tools / Equipment.
     – MBTA approved Cleaning Tools / Equipment (commercial).
  2. Material.
     – MBTA approved Cleaning Products (commercial) (Refer to Section 1 Table 1-9).

  Since the Passenger Compartment - Controls and Indicators consist of separate items, the Cleaning & Painting are described in the para(s) related to each item, as shown in Table 4-4.3

a) Cleaning

Table 4-4.3 Passenger Compartment - Controls and Indicators - Cleaning

COMPONENTS	CLEANING REFERENCE (Para)
Bridgeplate/Door Crew Key Switch	4-4.2.1.e a)
Bridgeplate Request Pushbutton	4-4.2.2.e a)
Passenger Stop Request Tape Switch	Refer to Section 7 MM
Manual Emergency Door Release Handle	4-4.2.4.e a)
Passenger Emergency Stop Handle	4-4.2.5.e a)
Door OUT-OF-SERVICE Handle	4-4.2.6.e a)
Bridgeplate Acoustic Alarm	TBD
Door Warning Acoustic Alarm	TBD
Door OPEN / CLOSE Warning Light	Refer to Section 6 of MM
Door OUT-OF-SERVICE Indicator Light	Refer to Section 6 of MM

b) Painting (Not Applicable)

4-4.2.f Inspection

- **Reference Information.**
  1. Tools / Equipment (Not Applicable).
     – MBTA Carhouse Standard Tools Kit.
  2. Material (Not Applicable).

  Since the Passenger Compartment - Controls and Indicators consist of separate items, the Inspection are described in the para(s) related to each item, as shown in Table below

Table 4-4.4 Passenger Compartment - Controls and Indicators - Inspection

COMPONENTS	INSPECTION REFERENCE (Para)
Bridgeplate/Door Crew Key Switch	4-4.2.1.f
Bridgeplate Request Pushbutton	4-4.2.2.f
Passenger Stop Request Tape Switch	Refer to Section 7 of this manual
Manual Emergency Door Release Handle	4-4.2.4.f
Passenger Emergency Stop Handle	4-4.2.5.f
Door OUT-OF-SERVICE Handle	4-4.2.6.f
Bridgeplate Acoustic Alarm	TBD
Door Warning Acoustic Alarm	TBD
Door OPEN / CLOSE Warning Light	Refer to Section 6 of MM
Door OUT-OF-SERVICE Indicator Light	Refer to Section 6 of MM

.

4-4.2.g Repair (Not applicable)

4-4.2.h Reassembly (Not applicable)

4-4.2.i Adjustment/Test

Since the Passenger Compartment - Controls and Indicators consist of separate items, the Adjustment / Test are described in the para(s) related to each item, as shown in Table 4-4.5.

Table 4-4.5 Passenger Compartment - Controls and Indicators – Adjustment/ Test

COMPONENTS	ADJUSTMENT REFERENCE (Para)	TEST REFERENCE (Para)
Bridgeplate/Door Crew Key Switch	Not Applicable	4-4.2.1.i b)
Bridgeplate Request Pushbutton	Not Applicable	4-4.2.2.i b)
Passenger Stop Request Tape Switch	Not Applicable	Refer to Section 7 MM
Manual Emergency Door Release Handle	Not Applicable	4-4.2.4.i. b)
Passenger Emergency Stop Handle	Not Applicable	4-4.2.5.i b)
Door OUT-OF-SERVICE Handle	Not Applicable	4-4.2.6.i b)
Bridgeplate Acoustic Alarm	Not Applicable	TBD
Door Warning Acoustic Alarm	Not Applicable	TBD
Door OPEN / CLOSE Warning Light	Not Applicable	Refer to Section 6 of MM
Door OUT-OF-SERVICE Indicator Light	Not Applicable	Refer to Section 6 of MM

4-4.2.1 Bridgeplate/Door Crew Key Switch

4-4.2.1.a Description and Operation

The vehicle (passenger compartment) is equipped with four Bridgeplate / Door Crew Key Switches (Refer to Figure 4-4.3) installed near the Passenger Doors (A2, A3, B2, B3 Doors) used to open / close the related door and to deploy the bridgeplate, through four switch positions: CLOSE, NEUTRAL, OPEN and B.P. DEPLOY. To operate the switch it is necessary the crew key.

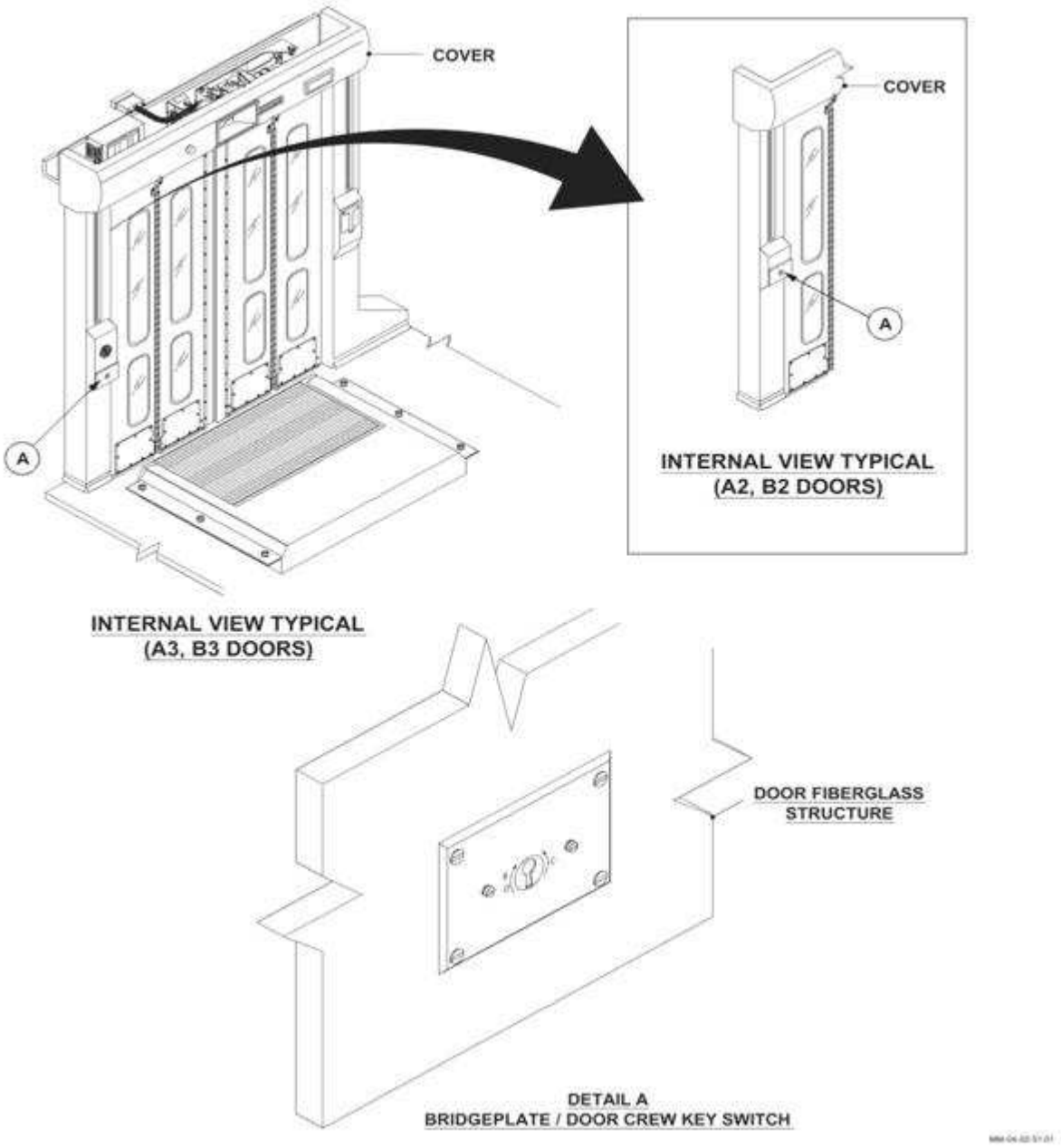


Figure 4-4.3 Bridgeplate/Door Crew Key Switch Location

4-4.2.1.b Specific Safety Precautions

WARNING:	**BEFORE PERFORMING BRIDGEPLATE / DOOR CREW KEY SWITCH MAINTENANCE PROCEDURES DISCONNECT ELECTRICAL POWER FROM VEHICLE BY SWITCHING OFF THE BATTERY CB (3Q03).**

4-4.2.1.c Fault/Isolation

The Bridgeplate / Door Crew Key Switch Fault Isolation/Repair, is included in Doors Fault Isolation/Repair procedure, refer to para 4-2.c.

4-4.2.1.d Disassembly (Not Applicable)

4-4.2.1.e Cleaning/Painting

a) Cleaning

> **WARNING: BEFORE PERFORMING BRIDGEPLATE / DOOR CREW KEY SWITCH CLEANING PROCEDURE DISCONNECT ELECTRICAL POWER FROM VEHICLE BY SWITCHING OFF THE BATTERY CB (3Q03).**

- **Reference Information.**
  1. Tools/Equipment.
     – MBTA approved Cleaning Tools / Equipment (commercial).
  2. Material.
     – MBTA approved Cleaning Products (commercial) (Refer to Section 1 Table 1-9).
- **Procedure.**

  To Clean each Bridgeplate / Door Crew Key Switch proceed as follows:

  Set the Vehicle in safety condition in accordance with MBTA Carhouse Regulations.

  – Switch OFF the Battery Circuit Breaker (CB 3Q03 – Battery Box).

  Clean and dry Crew Switch surface using mild detergent diluted in water brush and cleaning rags (Refer to Table 1-9 for MBTA approved Cleaning product list

b) Painting (Not Applicable)

4-4.2.1.f Inspection

> **WARNING: BEFORE PERFORMING BRIDGEPLATE / DOOR CREW KEY SWITCH INSPECTION PROCEDURE DISCONNECT ELECTRICAL POWER FROM VEHICLE BY SWITCHING OFF THE BATTERY CB (3Q03).**

- **Reference Information.**
  1. Tools / Equipment.
     – MBTA Carhouse Standard Tools Kit.
  2. Material (Not Applicable).
- **Procedure.**

  To Inspect each Bridgeplate / Door Crew Key Switch proceed as follows:

Set the Vehicle in safety condition in accordance with MBTA Carhouse Regulations.

– Switch OFF the Battery Circuit Breaker (CB 3Q03 – Battery Box).

Inspect switch cover for cracks otherwise damages and correct installation.

Inspect switch for loose fasteners, or foreign material which may obstructs the switch keyhole. Repair or replace as required.

Inspection results must be recorded on Defect Report Cards to allow the planning of Maintenance Operations.

4-4.2.1.g Repair (Not applicable)

4-4.2.1.h Reassembly (Not applicable)

4-4.2.1.i Adjustment/Test

a) Adjustment (Not Applicable)

b) Test

The Bridgeplate / Door Crew Key Switch Test, is included in Doors Test procedure, refer to para 4-2.ib).

4-4.2.2 Bridge p4late Request Pushbutton Assembly

4-4.2.2.a Description & Operation

The vehicle (passenger compartment) is equipped with six Bridgeplate Request Pushbuttons (Refer to Figure 4-4.4) installed near the Passenger Doors (A3, B3 Doors) and on the Passenger Emergency Intercom Box. The pushbutton is used from the passenger to ask for bridgeplate deployment

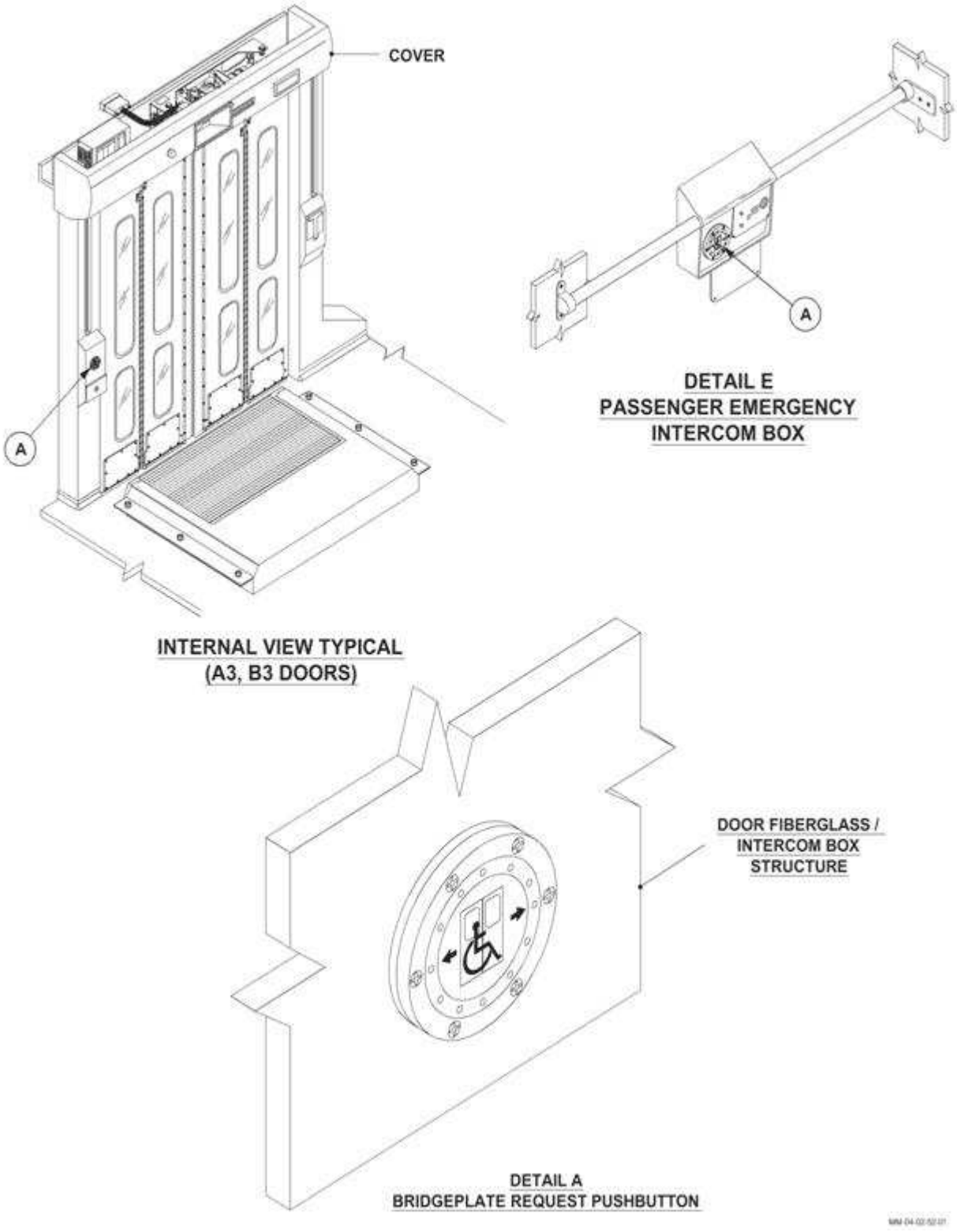


Figure 4-4.4 Bridgeplate Request Pushbutton Location

4-4.2.2.b Specific Safety Precautions

WARNING:	**BEFORE PERFORMING BRIDGEPLATE REQUEST PUSHBUTTON MAINTENANCE PROCEDURES DISCONNECT ELECTRICAL POWER FROM VEHICLE BY SWITCHING OFF THE BATTERY CB (3Q03).**

4-4.2.2.c Fault Isolation

The Bridgeplate Request Pushbutton Fault Isolation/Repair, is included in Doors Fault Isolation/Repair procedure, refer to para 4-2.c.

4-4.2.2.d Disassembly

- **Reference Information.**
  1. Tools / Equipment.
     – MBTA Overhaul Standard Tools Kit.
  2. Material (Not Applicable).
- **Procedure**

  Removing the pushbutton switch disassembles it. No further disassembly is possible

4-4.2.2.e Cleaning /painting

- **Reference Information.**
  1. Tools / Equipment.
     – MBTA approved Cleaning Tools / Equipment (commercial).
  2. Material.
     – MBTA approved Cleaning Products (commercial) (Refer to Section 1 Table 1-9).
- **Procedure.**

a) Cleaning

The switch is replaced at normal overhaul. If the switch is not to be replaced, clean the switch components as described in Table 4-4.6

NOTE **The switch gasket (3) must be replaced whenever the switch is removed from the car.**

Table 4-4.6. Pushbutton Switch Component Cleaning Instructions

FIGURE AND ITEM	PART NAME	CLEANING METHODS AND MATERIALS
Figure 4-4.5-1	Membrane switch	Moisten a rag with isopropyl alcohol and wipe the membrane switch clean of accumulated dirt.
-2	Spacer	Clean the spacer in a suitable solvent. Air blow dry and protect from corrosion.

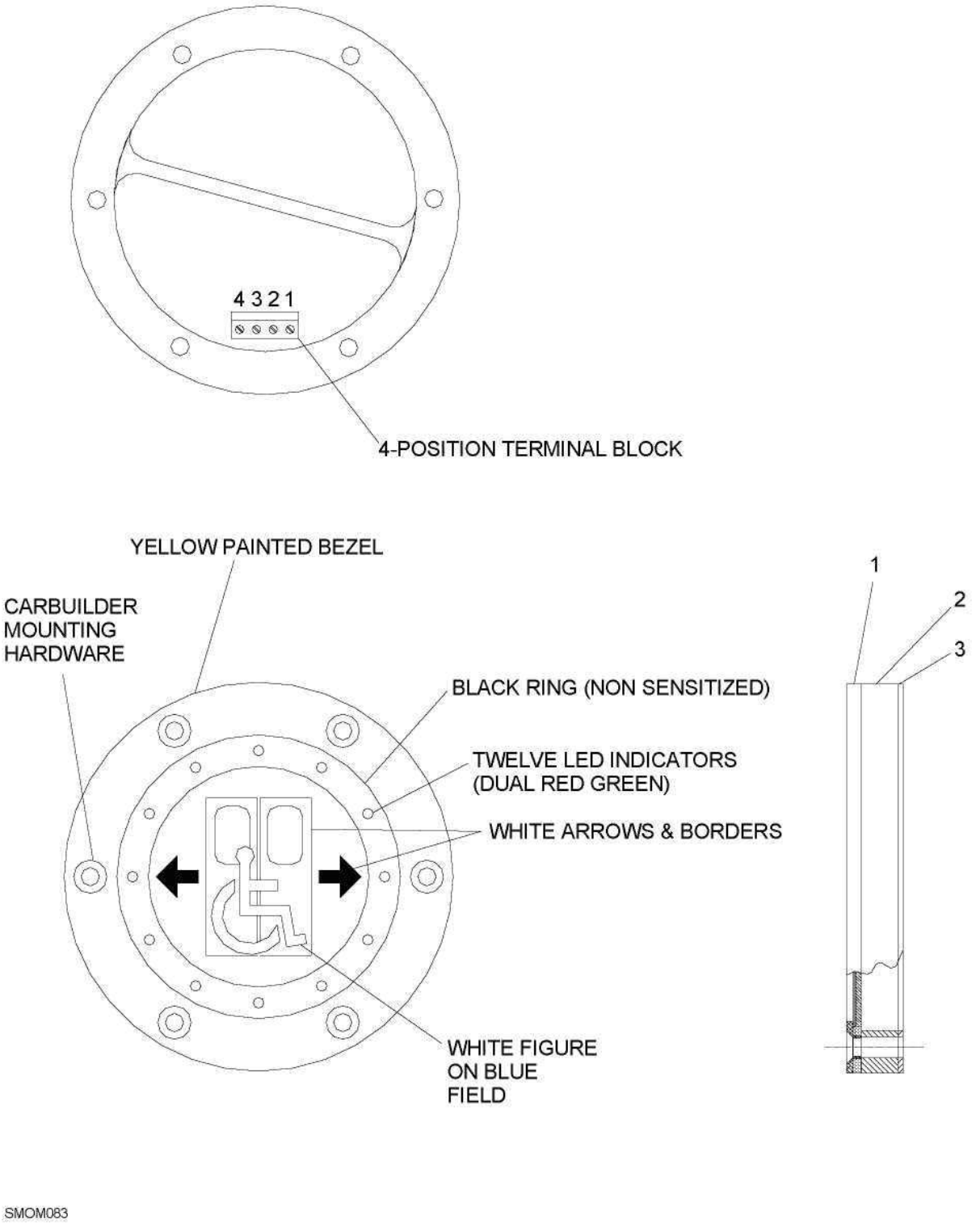


Figure 4-4.5. Passenger Pushbutton Assembly

b) Painting (Not applicable)

4-4.2.2.f Inspection

- **Reference Information.**

1. Tools / Equipment (Not Applicable).
   – MBTA Carhouse Standard Tools Kit.
2. Material (Not Applicable).

If the pushbutton switch is not to be replaced automatically, inspect the switch components as described in Table 4-4.7. Pushbutton Switch Component Inspection Methods and Criteria

Table 4-4.7. Pushbutton Switch Component Inspection Methods and Criteria

FIGURE AND ITEM	PART NAME	INSPECTION METHODS AND CRITERIA
Figure 4-4.5-1	Membrane switch	Visually inspect for wear and damage. Also inspect the switch face to make sure all markings are still egible Replace the switch if worn, damaged, or illegible.
-2	Spacer	Visually inspect the spacer for wear, damage, and corrosion.

4-4.2.2.g Repair (Not Applicable)

4-4.2.2.h Reassembly

- **Reference Information.**
  1. Tools / Equipment.
     – MBTA approved Cleaning Tools / Equipment (commercial).
  2. Material.
     – MBTA approved Cleaning Products (commercial) (Refer to Section 1 Table 1-9).
- **Procedure.**

The switch is reassembled at installation

4-4.2.2.i Adjustment/test

a) Adjustment

The pushbutton switch requires no adjustment at installation on the car**.**

b) Test

i) Bench Test

No bench testing of the pushbutton switch is required.

ii) On-Car Testing

The pushbutton switch is tested on the car with the door system operational.

1. Press the passenger pushbutton. The green LEDs on the passenger pushbutton must illuminate.
2. As the doors open and the bridgeplate deploys and then retracts, the green LEDs must flash.
3. Place the bridgeplate out-of-service switch on the door operator to BYPASS. The red LEDs on the passenger pushbutton must illuminate.

4-4.2.3 Passenger Stop Request Tape Switch

The Passenger Stop Request Tape Switch is included in the Passenger Stop Request System. For Description, Operation and Maintenance procedure refer to Section 7 of MM

4-4.2.4 Manual Emergency Door Release Handle

4-4.2.4.a Description and Operation

The vehicle (passenger compartment) is equipped with six Manual Emergency Door Release Handles (Refer to Figure 4-4.6) located on the Door Operator (A1, A2, A3, B1, B2, B3 Doors). When the handle is activated the vehicle goes in Emergency Condition and the PASSENGER EMERGENCY Indicator Light (red) on the Annunciator Panel turns on. Return the handle to NORMAL position to reset.

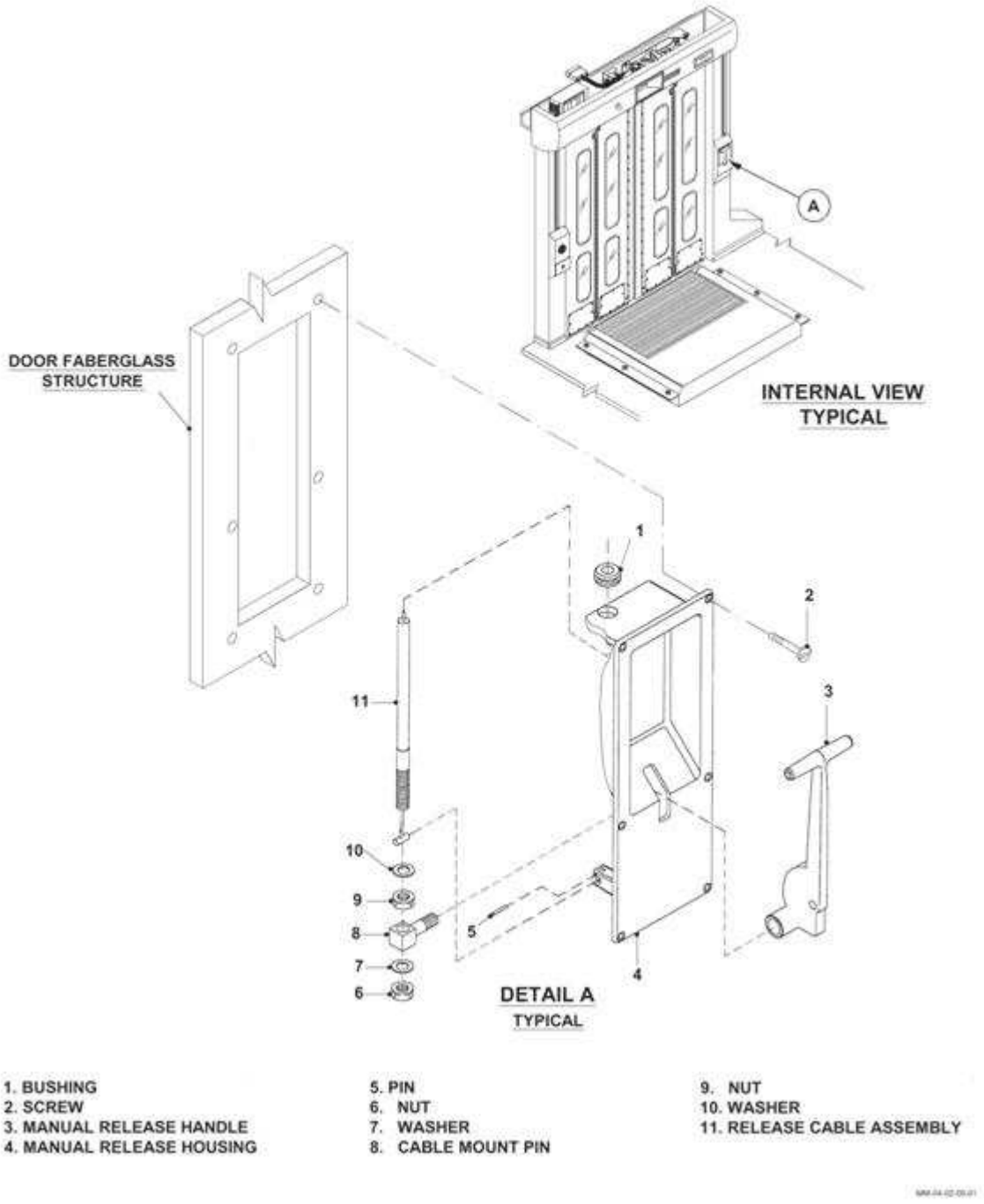


Figure 4-4.6 Manual Emergency Door Release Handle Location

4-4.2.4.b Specific Safety Precautions

WARNING:	**BEFORE PERFORMING MANUAL EMERGENCY DOOR RELEASE HANDLE MAINTENANCE PROCEDURES DISCONNECT ELECTRICAL POWER FROM VEHICLE BY SWITCHING OFF THE BATTERY CB (3Q03).**

4-4.2.4.c Fault Isolation/Repair

The Manual Emergency Door Release Handle Fault Isolation/Repair, is included in Doors Fault Isolation/Repair procedure, refer to para 4-2.c.

4-4.2.4.d Disassembly

- **Reference Information.**
  1. Tools / Equipment.
     – MBTA Overhaul Standard Tools Kit.
  2. Material (Not Applicable).
- **Procedure**

  Refer to 4-2.1.4.d b) for disassembly of Manual Emergency Door Release Handle

4-4.2.4.e Cleaning/Painting

a) Cleaning

WARNING:	**BEFORE PERFORMING MANUAL EMERGENCY DOOR RELEASE HANDLE CLEANING PROCEDURE DISCONNECT ELECTRICAL POWER FROM VEHICLE BY SWITCHING OFF THE BATTERY CB (3Q03).**

- **Reference Information.**
  1. Tools / Equipment.
     – MBTA approved Cleaning Tools / Equipment (commercial).
  2. Material.
     – MBTA approved Cleaning Products (commercial) (Refer to Section 1 Table 1-9).
- **Procedure.**

To Clean each Manual Emergency Door Release Handle proceed as follows:

1. Set the Vehicle in safety condition in accordance with MBTA Carhouse Regulations.
   - Switch OFF the Battery Circuit Breaker (CB 3Q03 – Battery Box).
2. Open the hinged cover installed above each door.
3. Clean and dry Manual Emergency Door Release Handle using mild detergent diluetd in water, brush and cleaning rags. (Refer to Table 1-9 for MBTA approved Cleaning Product List).

b) Painting (Not applicable)

4-4.2.4.f Inspection

WARNING:	**BEFORE PERFORMING MANUAL EMERGENCY DOOR RELEASE HANDLE INSPECTION PROCEDURE DISCONNECT ELECTRICAL POWER FROM VEHICLE BY SWITCHING OFF THE BATTERY CB (3Q03).**

- **Reference Information.**
  1. Tools / Equipment.
     - MBTA Carhouse Standard Tools Kit.
  2. Material (Not Applicable).
- **Procedure.**

  To Inspect each Manual Emergency Door Release Handle proceed as follows:

  1. Set the Vehicle in safety condition in accordance with MBTA Carhouse Regulations.
     - Switch OFF the Battery Circuit Breaker (CB 3Q03 – Battery Box).
  2. Inspect handle for cracks, otherwise damages and correct installation, replace if necessary.
  3. Inspect Manual Release Cable for correct installation, tightening the mounting hardware as required.
  4. Inspection results must be recorded on Defect Report Cards to allow the planning of Maintenance Operations.

4-4.2.4.g Repair (Not Applicable)

4-4.2.4.h Reassembly

- **Reference Information.**
  1. Tools / Equipment.
     – MBTA Overhaul Standard Tools Kit.
  2. Material (Not Applicable).
- **Procedure**

  Refer to section 4-2.1.4.h. a) for reassembly of Manual Emergency Door Release Handle

4-4.2.4.i Adjustment/test

a) Adjustment (Not Applicable)

b) Test

The Manual Emergency Door Release Handle Test, is included in Doors Test procedure, refer to para 4-2.ib).

4-4.2.5 Passenger Emergency Stop Handle

4-4.2.5.a Description and Operation

The vehicle (passenger compartment) is equipped with four Passenger Emergency Stop Handle (Refer to Figure 4-4.7) installed near the Passenger Doors (A2, A3, B2, B3 Doors). When the handle is activated the vehicle goes in Emergency Condition and the PASSENGER EMERGENCY Indicator Light (red) on the Annunciator Panel turns on. Return the handle to NORMAL position to reset.

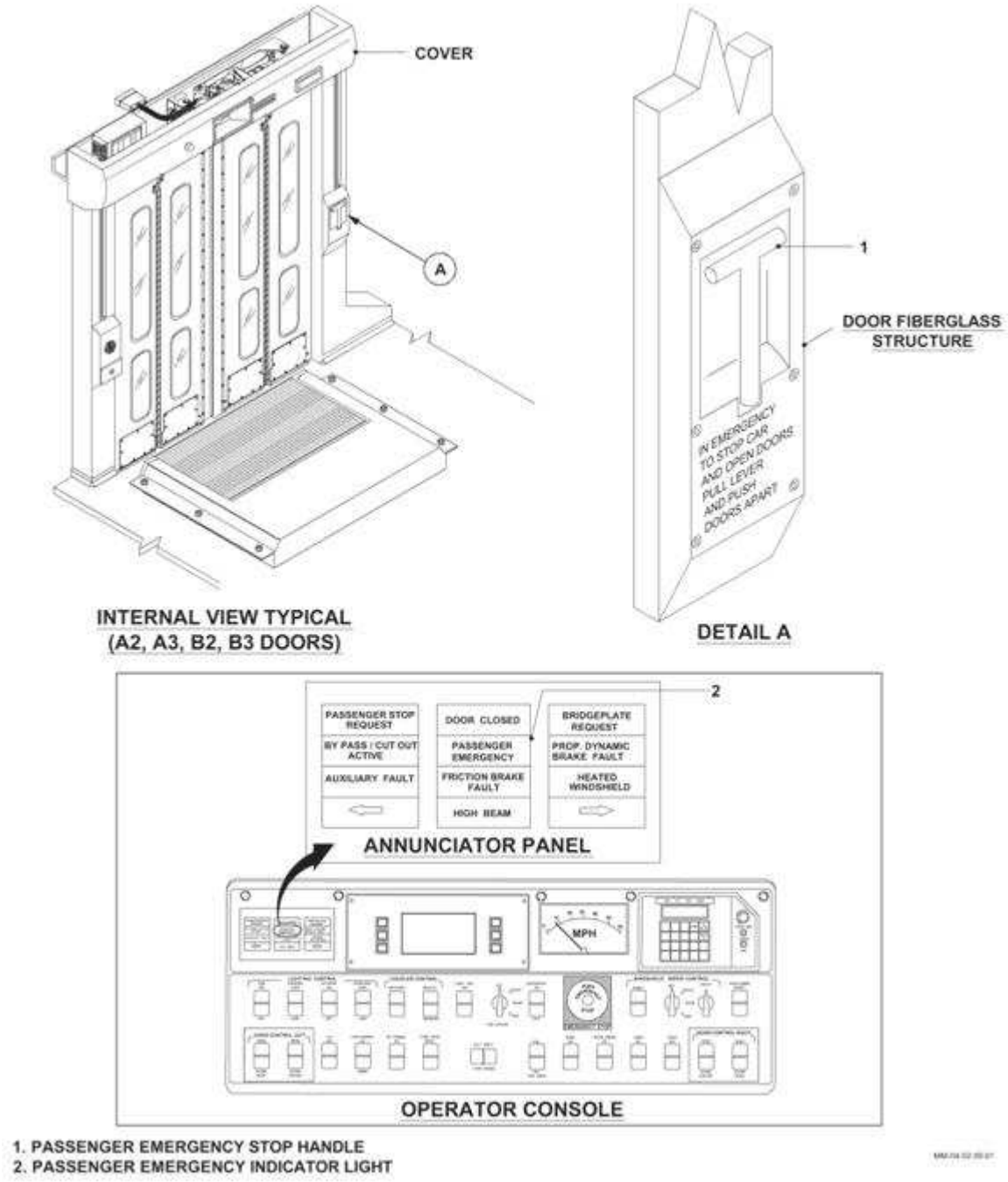


Figure 4-4.7 Passenger Emergency Stop Handle Location

4-4.2.5.b Specific Safety Precautions

WARNING:	**before performing Passenger Emergency Stop Handle maintenance procedures disconnect electrical power from vehicle by switching off the battery cb (3q03).**

4-4.2.5.c Fault Isolation

The Bridgeplate Request Pushbutton Fault Isolation, is included in Doors Fault Isolation/Repair procedure, refer to para 4-2.c

4-4.2.5.d Disassembly

- **Reference Information.**
  1. Tools / Equipment.
     – MBTA Overhaul Standard Tools Kit.
  2. Material (Not Applicable).

Refer to section 4-2.1.4.d b) Passenger Emergency Stop Handle

4-4.2.5.e Cleaning/Painting

a) Cleaning

WARNING:	**BEFORE PERFORMING PASSENGER EMERGENCY STOP HANDLE CLEANING PROCEDURE DISCONNECT ELECTRICAL POWER FROM VEHICLE BY SWITCHING OFF THE BATTERY CB (3Q03).**

- **Reference Information.**
  1. Tools / Equipment.
     – MBTA approved Cleaning Tools / Equipment (commercial).
  2. Material.
     – MBTA approved Cleaning Products (commercial) (Refer to Section 1 Table 1-9).
- **Procedure**

  To Clean each Passenger Emergency Stop Handle proceed as follows:

  1. Set the Vehicle in safety condition in accordance with MBTA Carhouse Regulations.
     – Switch OFF the Battery Circuit Breaker (CB 3Q03 – Battery Box).

2. Clean and dry Passenger Emergency Stop Handle using mild detergent diluetd in water, brush and cleaning rags. (Refer to Table 1-9 for MBTA approved Cleaning Product List).

b) Painting (Not applicable)

4-4.2.5.f Inspection

WARNING:	**BEFORE PERFORMING PASSENGER EMERGENCY STOP HANDLE INSPECTION PROCEDURE DISCONNECT ELECTRICAL POWER FROM VEHICLE BY SWITCHING OFF THE BATTERY CB (3Q03).**

- **Reference Information.**
  1. Tools / Equipment.
     – MBTA Carhouse Standard Tools Kit.
  2. Material (Not Applicable).
- **Procedure.**

  To Inspect each Passenger Emergency Stop Handle proceed as follows:

  1. Set the Vehicle in safety condition in accordance with MBTA Carhouse Regulations.
     – Switch OFF the Battery Circuit Breaker (CB 3Q03 – Battery Box).
  2. Inspect handle for cracks, otherwise damages and correct installation replace if necessary.
  3. Inspect Manual Release Cable, tightening the mounting hardware as required.
  4. Inspection results must be recorded on Defect Report Cards to allow the planning of Maintenance Operations.

4-4.2.5.g Repair (Not applicable)

4-4.2.5.h Reassembly

- **Reference Information.**
  1. Tools / Equipment.
     – MBTA Overhaul Standard Tools Kit.
  2. Material (Not Applicable).
- **Procedure**

  Refer to section to 4-2.1.4.h a) for Reassembly of Passenger Emergency Stop Handle

4-4.2.5.i Adjustment/Test

a) Adjustment (Not Applicable)

b) Test

The Passenger Emergency Stop Handle Test, is included in Doors Test procedure, refer to para 4-2.ib).

4-4.2.6 Door Out Of Service Handle

4-4.2.6.a Description and Operation

The vehicle (passenger compartment) is equipped with six Door OUT-OF-SERVICE Handles (Refer to Figure 4-4.8) located near the Door Control Module (DCM) (A1, A2, A3, B1, B2, B3 Doors). When the handle is moved from NORMAL position the OUT-OF-SERVICE Switch is activated and the door motor shuts down. In this condition the Door OUT-OF-SERVICE Indicator Light (internal and external) turns on. To operate the handle it is necessary open the cover installed above each door.

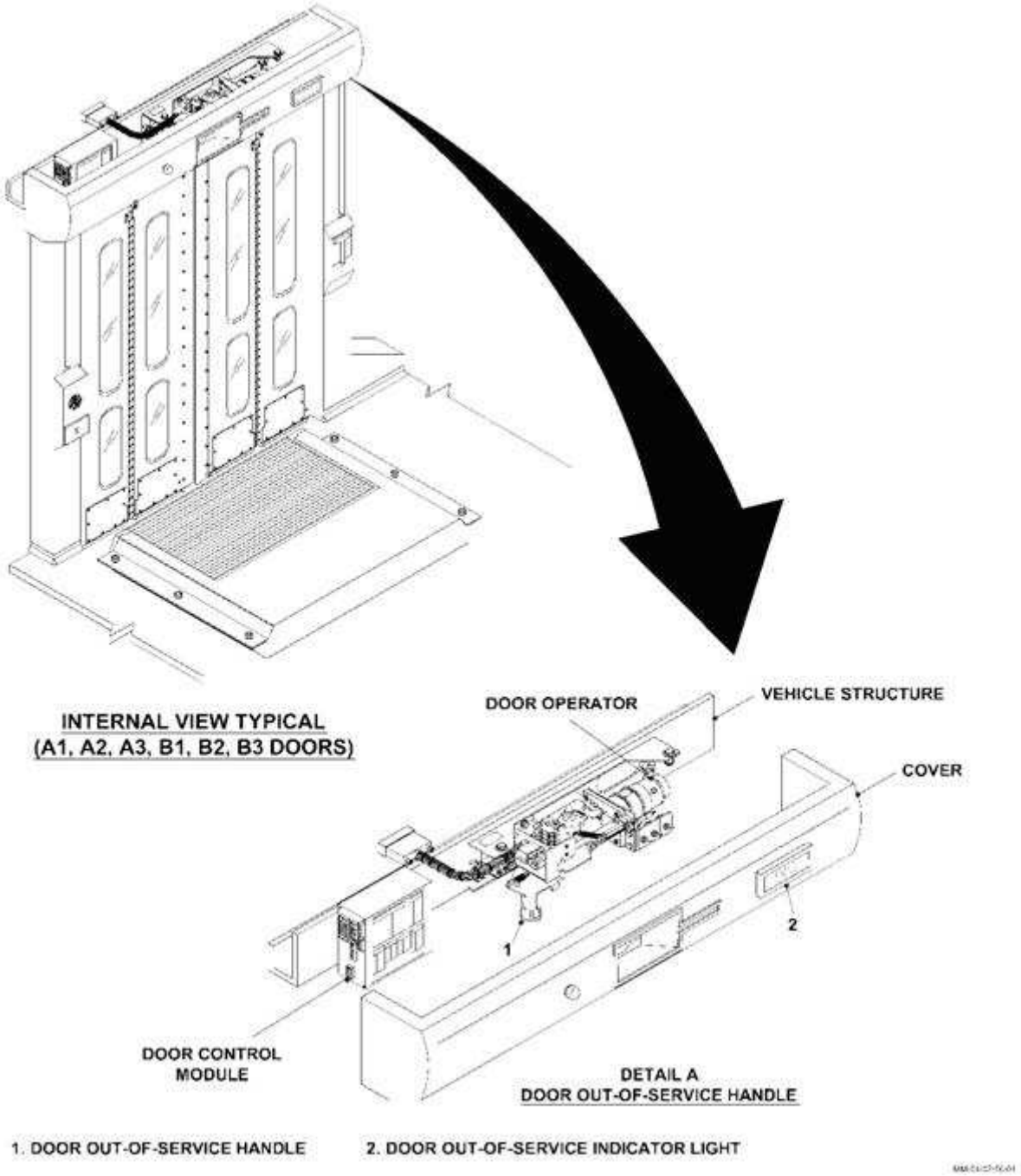


Figure 4-4.8 Door OUT-OF-SERVICE Handle Location

4-4.2.6.b Specific Safety Precautions

WARNING:	**BEFORE PERFORMING DOOR OUT-OF-SERVICE HANDLE MAINTENANCE PROCEDURES DISCONNECT ELECTRICAL POWER FROM VEHICLE BY SWITCHING OFF THE BATTERY CB (3Q03).**

4-4.2.6.c Fault Isolation

The Door OUT-OF-SERVICE Handle Fault Isolation, is included in Doors Fault Isolation/Repair procedure, refer to para 4-2.c.

4-4.2.6.d Disassembly

- **Reference Information.**
  1. Tools / Equipment.
     – MBTA Overhaul Standard Tools Kit.
  2. Material (Not Applicable).
- **Procedure**

Refer to section to 4-2.1.5.d b for Disaassembly of Door Out Of Service Handle

4-4.2.6.e Cleaning/Painting

a) Cleaning

WARNING:	**BEFORE PERFORMING DOOR OUT-OF-SERVICE HANDLE CLEANING PROCEDURE DISCONNECT ELECTRICAL POWER FROM VEHICLE BY SWITCHING OFF THE BATTERY CB (3Q03).**

- **Reference Information**
  1. Tools / Equipment.
     – MBTA approved Cleaning Tools / Equipment (commercial).
  2. Material.
     – MBTA approved Cleaning Products (commercial) (Refer to Section 1 Table 1-9).
- **Procedure.**

To Clean each Passenger Emergency Stop Handle proceed as follows:

1. Set the Vehicle in safety condition in accordance with MBTA Carhouse Regulations.
   – Switch OFF the Battery Circuit Breaker (CB 3Q03 – Battery Box).
2. Open the hinged cover installed above the door.

3. Clean and dry Door OUT-OF-SERVICE Handle mild detergent diluetd in water, brush and cleaning rags. (Refer to Table 1-9 for MBTA approved Cleaning Product List).

b) Painting (Not Applicable)

4-4.2.6.f Inspection

WARNING:	**BEFORE PERFORMING DOOR OUT-OF-SERVICE HANDLE INSPECTION PROCEDURE DISCONNECT ELECTRICAL POWER FROM VEHICLE BY SWITCHING OFF THE BATTERY CB (3Q03).**

- **Reference Information.**
  1. Tools / Equipment.
     – MBTA Carhouse Standard Tools Kit.
  2. Material (Not Applicable).
- **Procedure.**

To Inspect each Passenger Emergency Stop Handle proceed as follows:

1. Set the Vehicle in safety condition in accordance with MBTA Carhouse Regulations.
   – Switch OFF the Battery Circuit Breaker (CB 3Q03 – Battery Box).
2. Open the hinged cover installed above the door.
3. Inspect handle for cracks, otherwise damages and correct installation replace if necessary.
4. Inspection results must be recorded on Defect Report Cards to allow the planning of Maintenance Operations.

4-4.2.6.g Repair (Not applicable)

4-4.2.6.h Reassembly

- **Reference Information.**
  1. Tools / Equipment.
     – MBTA Overhaul Standard Tools Kit.
  2. Material (Not Applicable).
- **Procedure**

Refer to section 4-2.1.5.h a) for Reassembly of Door Out Of Service Handle

4-4.2.6.i Adjustment/Test

a) Adjustment (Not Applicable)

b) Test

The Door OUT-OF-SERVICE Handle Test, is included in Doors Test procedure, refer to para 4-2.ib).

4-4.2.7 Bridgeplate Acoustic Alarm

4-4.2.7.a Description and Operation

The vehicle (passenger compartment) is equipped with four Bridgeplate Acoustic Alarm (Refer to Figure 4-4.9) located near the Door Control Module (DCM) (A2, A3, B2, B3 Doors). TBD.

TBD

Figure 4-4.9 Bridgeplate Acoustic Alarm Location

4-4.2.8 Door Warning Acoustic Alarm

4-4.2.8.a Description and Operation

The vehicle (passenger compartment) is equipped with six Door Warning Acoustic Alarm (Refer to Figure 4-4.10) located near the Door Control Module (DCM) (A1, A2, A3, B1, B2, B3 Doors). TBD.

TBD

Figure 4-4.10 Door Warning Acoustic Alarm Location

4-4.2.9 Door OPEN / CLOSE Warning Light

4-4.2.9.a Description and Operation

The vehicle (passenger compartment) is equipped with six Door OPEN / CLOSE Warning Light (red) (Refer to Figure 4-4.11) located above each door (A1, A2, A3, B1, B2, B3 Doors), when lit it indicates that the related door is open or unlocked. Each light turn on automatically when the doors are opened and turn off when the doors are closed. For Door OPEN / CLOSE Warning Light Description, Operation and the Maintenance procedure, refer to Section 6 of MM

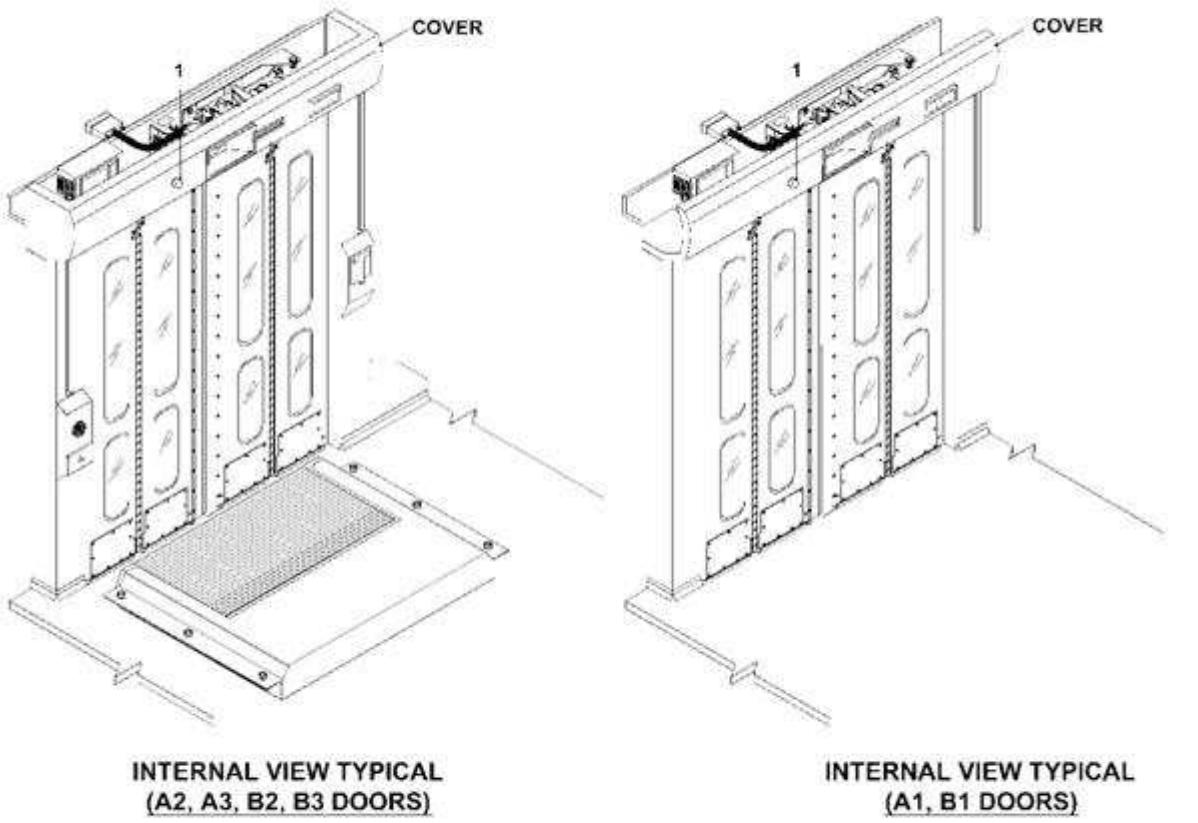
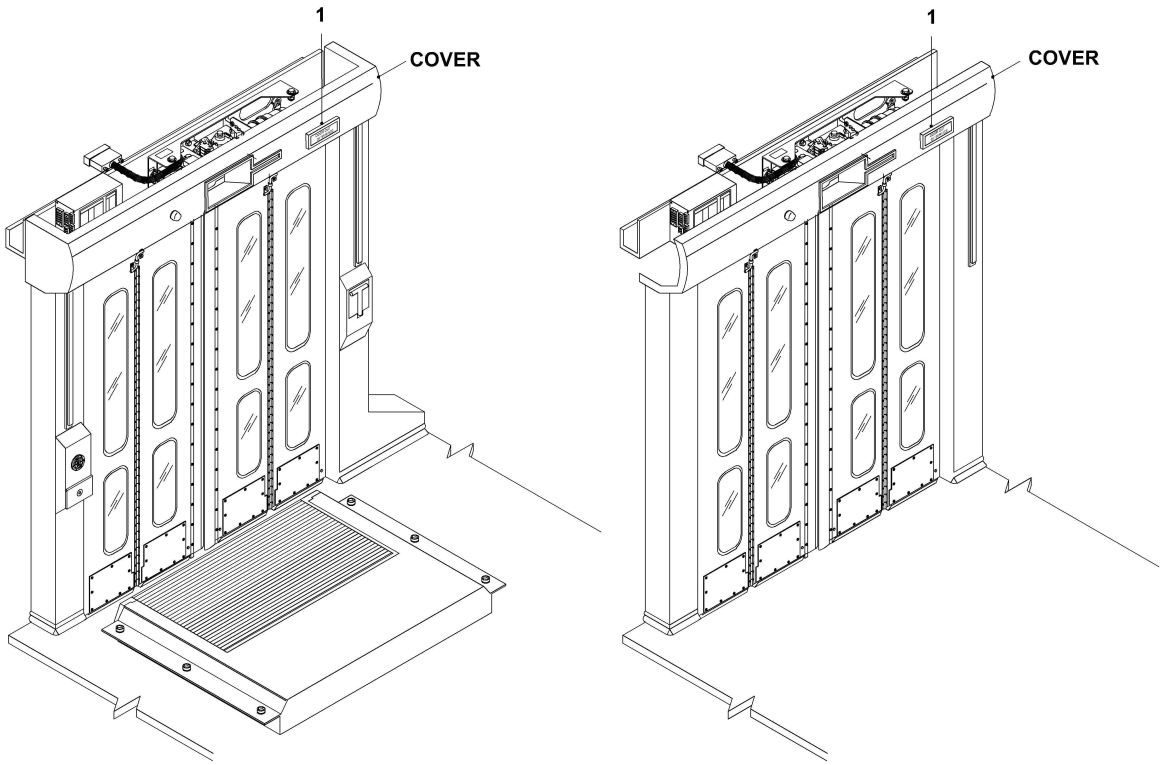


Figure 4-4.11 Door OPEN / CLOSE Warning Light Location

4-4.2.10 Door OUT-OF-SERVICE Indicator Light

4-4.2.10.a Description and Operation

The vehicle (passenger compartment) is equipped with six Door OUT-OF-SERVICE Indicator Light (red) (Refer to Figure 4-4.12) located above each door (A1, A2, A3, B1, B2, B3 Doors), when lit it indicates the DOOR OUT OF SERVICE. For Door OUT-OF-SERVICE Indicator Light Description, Operation and the Maintenance procedure, refer to Section 6 of this Manual.



INTERNAL VIEW TYPICAL
(A2, A3, B2, B3 DOORS)

INTERNAL VIEW TYPICAL
(A1, B1 DOORS)

1. DOOR OUT-OF-SERVICE INDICATOR LIGHT

MM-04-02-58-01

Figure 4-4.12 Door OPEN / CLOSE Indicator Light Location

4-4.3 External Vehicle - Controls and Indicators

4-4.3.a Description and Operation

The External Vehicle - Controls and Indicators includes the following controls and indicators (Refer to Figure 4-4.13 for location):

- Door Crew Key Switch.
- Bridge plate/Door Crew Key Switch.
- Bridge plate Request Pushbutton.
- External Emergency Door Release Handle.
- Door OPEN Light and CLOSE Warning Signal.

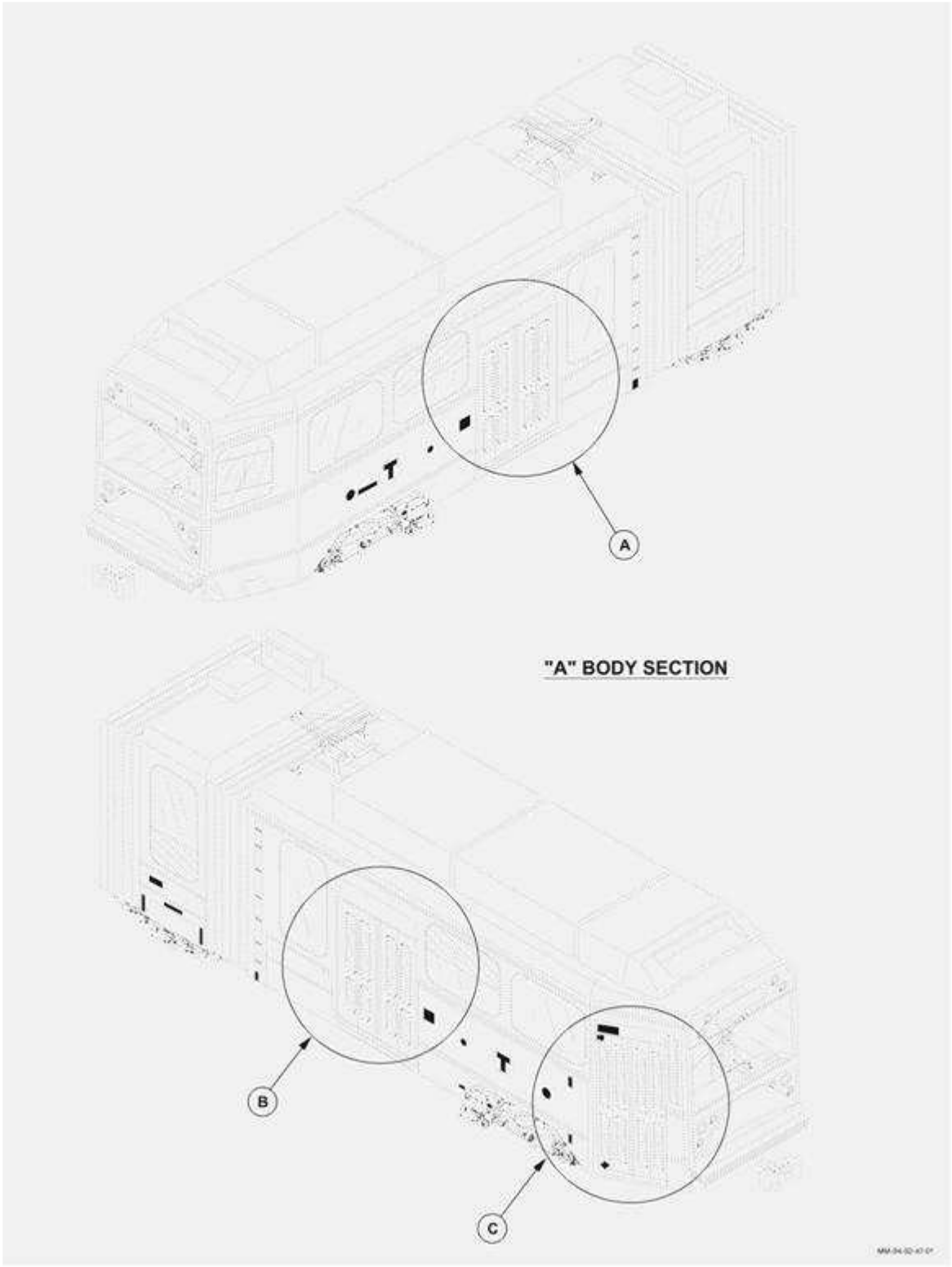


Figure 4-4.13 External Vehicle - Controls and Indicators Location (Sheet 1 of 5)

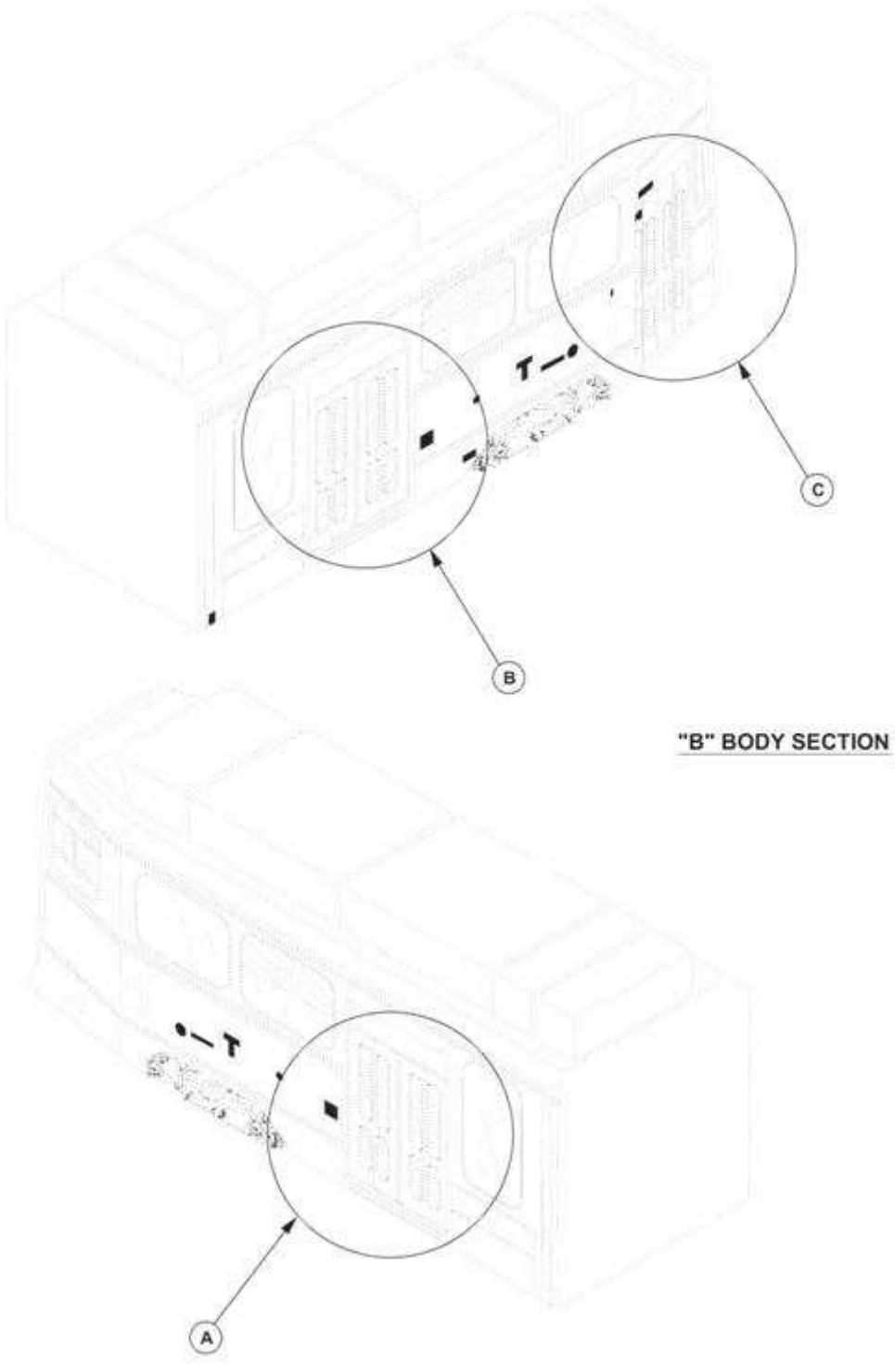
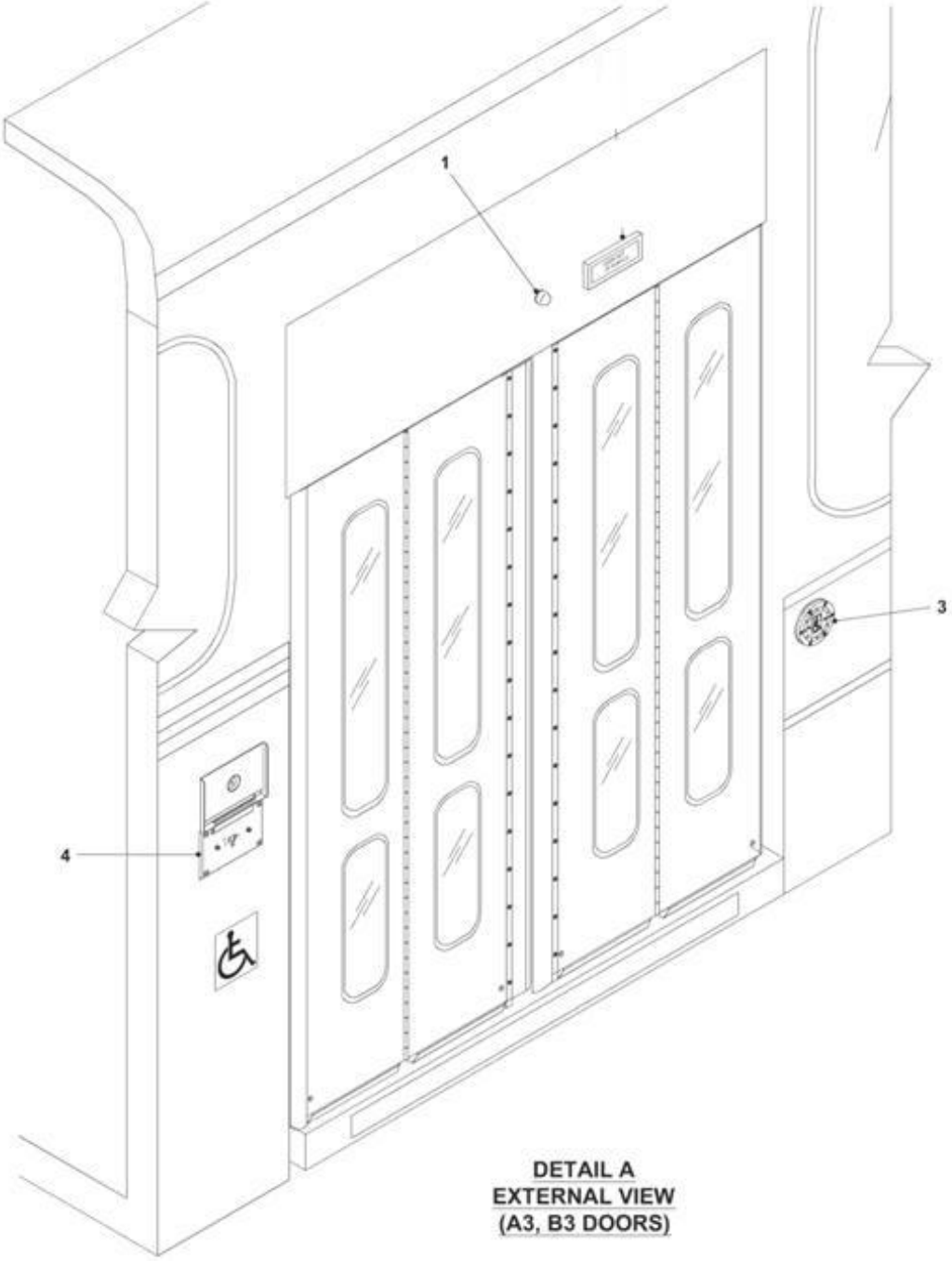


Figure 4-4.13 External Vehicle - Controls and Indicators Location (Sheet 2 of 5)



1. DOOR OPEN / CLOSE WARNING LIGHT
2 DELETED
3. BRIDGEPLATE REQUEST PUSHBUTTON
4. BRIDGEPLATE / DOOR CREW KEY SWITCH

Figure 4-4.13 External Vehicle - Controls and Indicators Location (Sheet 3 of 5)

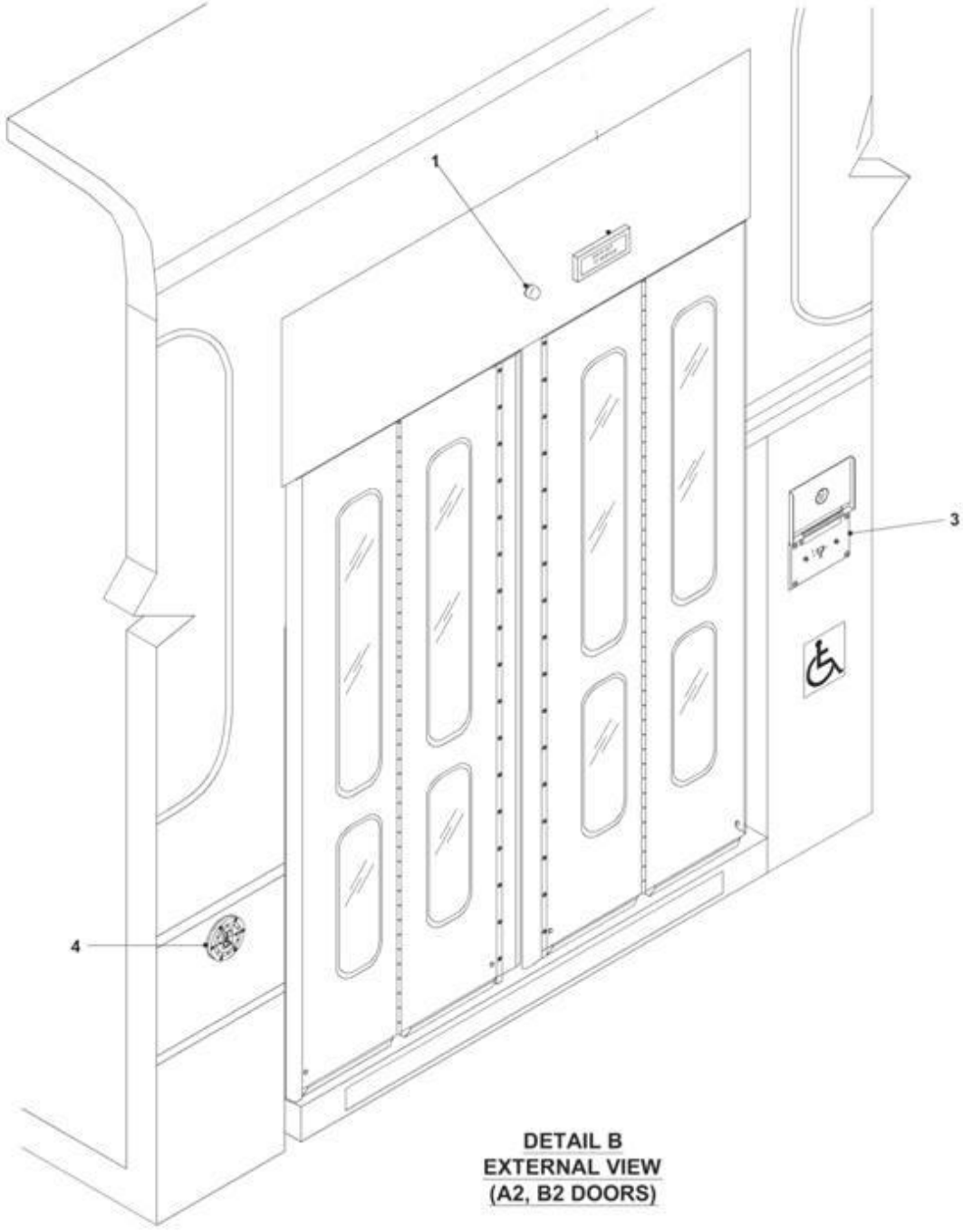
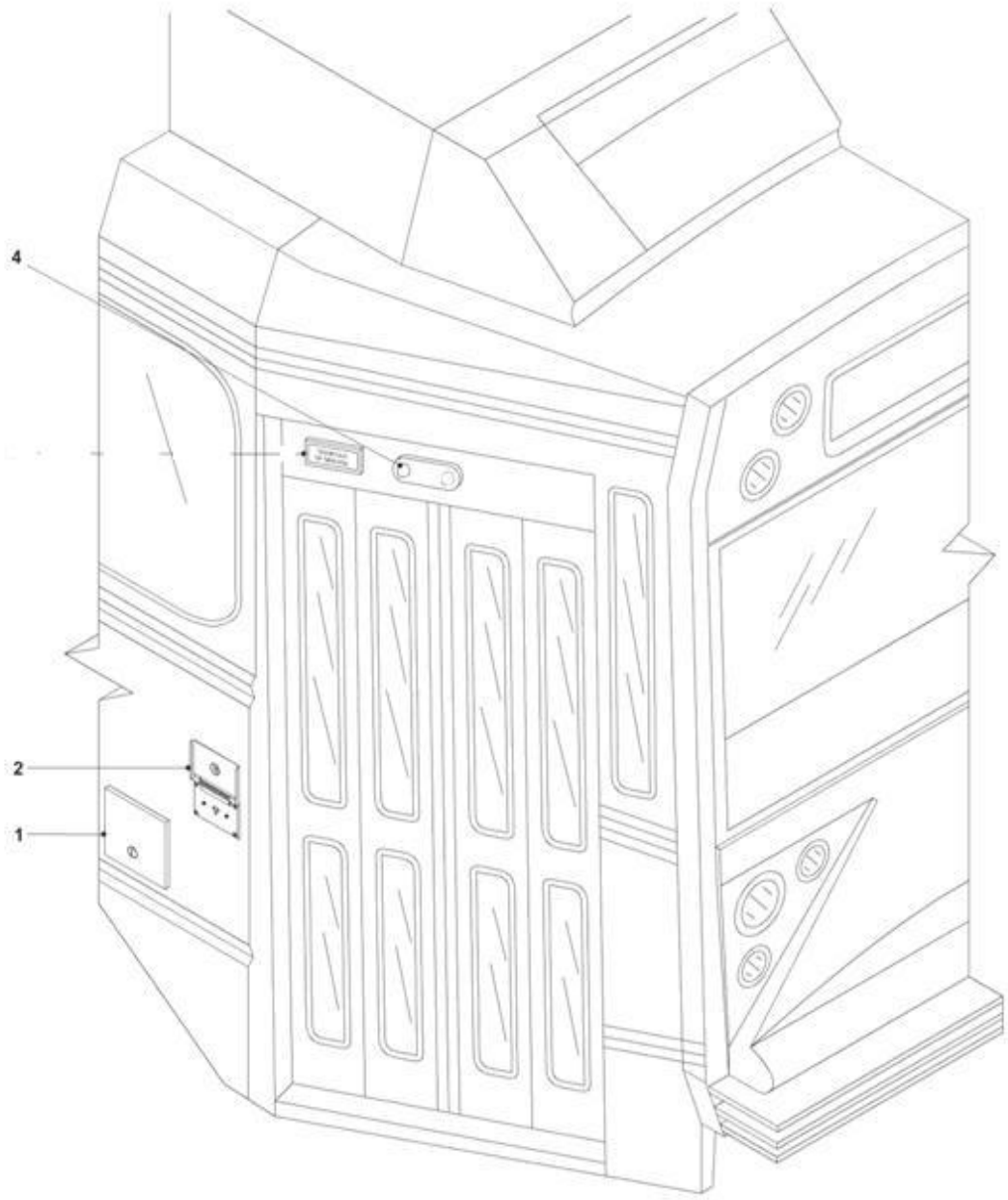


Figure 4-4.13 External Vehicle - Controls and Indicators Location (Sheet 4 of 5)



DETAIL C
EXTERNAL VIEW
(A1, B1 DOORS)

1. EXTERNAL EMERGENCY DOOR RELEASE HANDLE
2. DOOR CREW KEY SWITCH
3 DELETED
4. DOOR OPEN / CLOSE WARNING LIGHT

MM-04-02-47-05

Figure 4-4.13 External Vehicle - Controls and Indicators Location (Sheet 5 of 5)

4-4.3.b Specific Safety Precaution

Since the External Vehicle - Controls and Indicators consist of separate items, the Specific Safety Precautions are described in the para(s) related to each item.

4-4.3.c Fault isolation

Since the Passenger Compartment - Controls and Indicators consist of separate items, the Fault Isolation are described in the para(s) related to each item, as shown in Table 4-4.8

Table 4-4.8 Passenger Compartment - Controls and Indicators - Fault Isolation

COMPONENTS	FAULT ISOLATION REFERENCE (Para)
Door Crew Key Switch	4-4.3.1.c
Bridgeplate/Door Crew Key Switch	4-4.3.2.c
Bridgeplate Request Pushbutton	4-4.3.3.c
External Emergency Door Release Handle	4-4.3.4.c
Door OUT-OF-SERVICE Handle	4-4.3.5.c
Door OPEN / CLOSE Warning Light	Refer to Section 6 MM

4-4.3.d Disassembly

- **Reference Information.**
  1. Tools / Equipment.
     – MBTA Overhaul Standard Tools Kit.
  2. Material (Not Applicable).
- **Procedure**

  Since the External Vehicle - Controls and Indicators consist of separate items, the Disassembly is described in the para(s) related to each item, as shown in Table 4-4.9

Table 4-4.9 External vehicle - Controls and Indicators – Disassembly

COMPONENTS	REMOVAL REFERENCE (Para)
Door Crew Key Switch	4-4.3.1.d
Bridgeplate/Door Crew Key Switch	4-4.3.2.d
Bridgeplate Request Pushbutton	4-4.3.3.d
External Emergency Door Release Handle	4-4.3.4.d
Door OUT-OF-SERVICE Handle	4-4.3.5.d
Door OPEN / CLOSE Warning Light	Refer to Section 6 of MM

4-4.3.e Cleaning/Painting

- **Reference Information.**
  1. Tools / Equipment.
     – MBTA approved Cleaning Tools / Equipment (commercial).
  2. Material.
     – MBTA approved Cleaning Products (commercial) (Refer to Section 1 Table 1-9).

  Since the External Vehicle - Controls and Indicators consist of separate items, the Cleaning are described in the para(s) related to each item, as shown in Table 4-4.10.

Table 4-4.10 External Vehicle - Controls and Indicators - Cleaning

COMPONENTS	CLEANING REFERENCE (Para)
Door Crew Key Switch	4-4.3.1.e a)
Bridgeplate/Door Crew Key Switch	4-4.3.2.e a)
Bridgeplate Request Pushbutton	4-4.3.3.e a)
External Emergency Door Release Handle	4-4.3.4.e a)
Door OUT-OF-SERVICE Handle	4-4.3.5.e a)
Door OPEN / CLOSE Warning Light	Refer to Section 6 of MM

a) Painting (Not Applicable)

4-4.3.f Inspection

- **Reference Information.**
  1. Tools / Equipment (Not Applicable).
     – MBTA Carhouse Standard Tools Kit.

  2. Material (Not Applicable).

Since the External Vehicle - Controls and Indicators consist of separate items, the Inspection is described in the para(s) related to each item, as shown in Table 4-4.11.

Table 4-4.11 External Vehicle - Controls and Indicators – Inspection

COMPONENTS	INSPECTION REFERENCE (Para)
Door Crew Key Switch	4-4.3.1.f
Bridgeplate/Door Crew Key Switch	4-4.3.2.f
Bridgeplate Request Pushbutton	4-4.3.3.f
External Emergency Door Release Handle	4-4.3.4.f
Door OUT-OF-SERVICE Handle	4-4.3.5.f
Door OPEN / CLOSE Warning Light	Refer to Section 6 of MM

4-4.3.g Repair

Since the External Vehicle - Controls and Indicators consist of separate items, the Repair is described in the para(s) related to each item, as shown in Table 4-4.12**.**

Table 4-4.12 External Vehicle - Controls and Indicators - Repair

COMPONENTS	REPAIR REFERENCE (Para)
Door Crew Key Switch	Not Applicable
Bridgeplate/Door Crew Key Switch	Not Applicable
Bridgeplate Request Pushbutton	Not Applicable
External Emergency Door Release Handle	Not Applicable
Door OUT-OF-SERVICE Handle	Not Applicable
Door OPEN / CLOSE Warning Light	Not Applicable

4-4.3.h Reassembly

- **Reference Information.**
  1. Tools / Equipment.
     – MBTA Overhaul Standard Tools Kit.
  2. Material (Not Applicable).

  Since the External Vehicle - Controls and Indicators consist of separate items, the Reassembly is described in the para(s) related to each item, as shown in Table 4-4.13.

Table 4-4.13 External Vehicle - Controls and Indicators - Reassembly

COMPONENTS	INSTALLATION REFERENCE (Para)
Door Crew Key Switch	4-4.3.1.h
Bridgeplate/Door Crew Key Switch	4-4.3.2.h
Bridgeplate Request Pushbutton	4-4.3.3.h
External Emergency Door Release Handle	4-4.3.4.h
Door OUT-OF-SERVICE Handle	4-4.3.5.h
Door OPEN / CLOSE Warning Light	Refer to Section 6 of MM

4-4.3.i Adjustment / Test

Since the External Vehicle - Controls and Indicators consist of separate items, the Adjustment / Test are described in the para(s) related to each item, as shown in Table 4-4.14

Table 4-4.14 External Vehicle - Controls and Indicators - Adjustment / Test

COMPONENTS	ADJUSTMENT REFERENCE (Para)	TEST REFERENCE (Para)
Door Crew Key Switch	Not Applicable	4-4.3.1.i b)
Bridgeplate/Door Crew Key Switch	Not Applicable	4-4.3.2.i b)
Bridgeplate Request Pushbutton	Not Applicable	4-4.3.3.i b)
External Emergency Door Release Handle	Not Applicable	4-4.3.4.i b)
Door OUT-OF-SERVICE Handle	Not Applicable	4-4.3.5.i b)
Door OPEN / CLOSE Warning Light	Not Applicable	Refer to Section 6 of MM

4-4.3.1 Door Crew Key Switch

4-4.3.1.a Description and Operation

The vehicle (external vehicle) is equipped with two Door Crew Key Switches (Refer to Figure 4-4.14) installed near the Operator Doors (A1, B1 Doors). The switch is used to open / close the related door, through three positions: CLOSE, NEUTRAL and OPEN. The switch is protected with a hinged cover and to operate it is necessary the crew key.

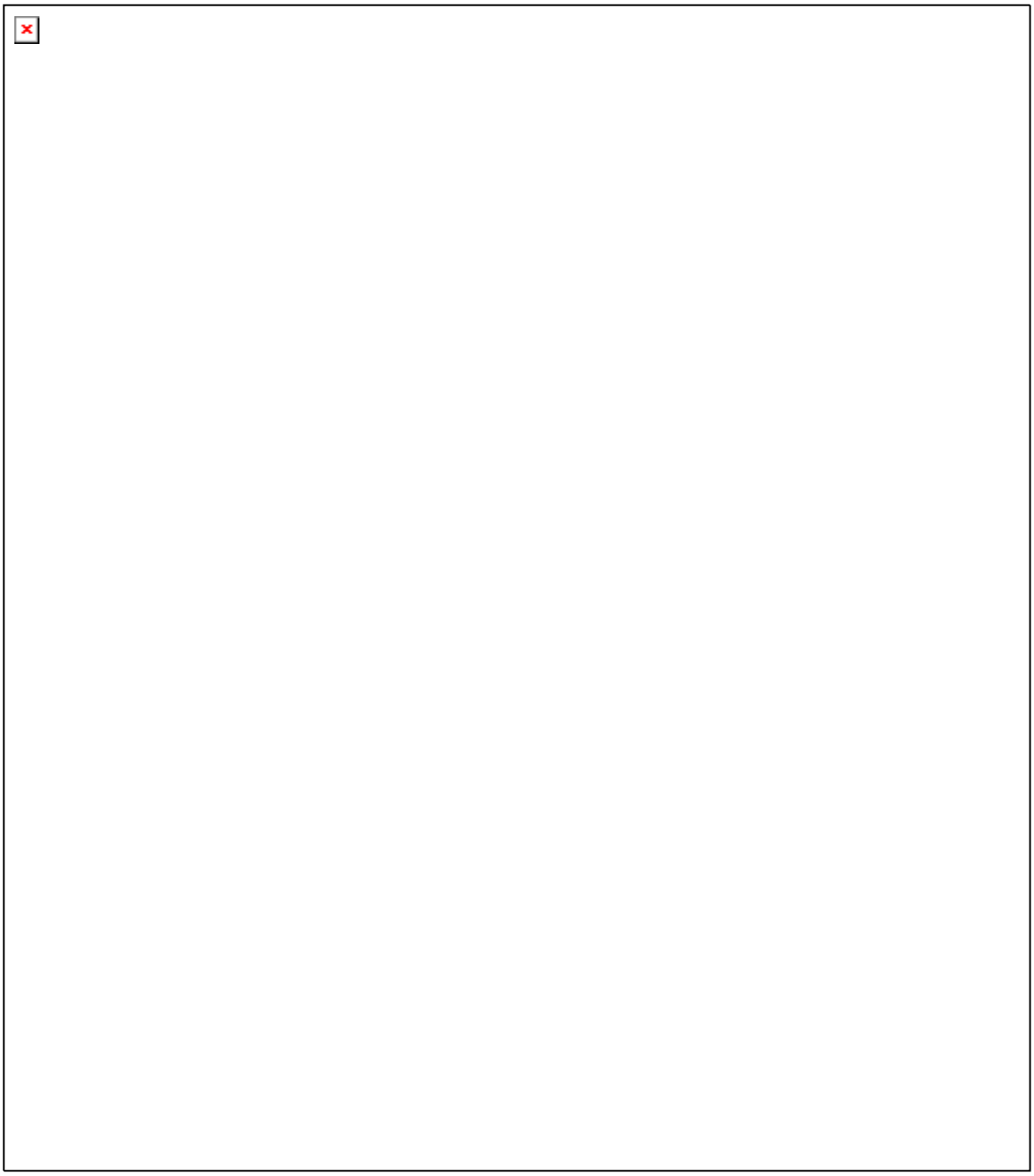


Figure 4-4.14 Door Crew Key Switch Location

4-4.3.1.b Specific Safety Precautions

WARNING:	**before performing Door Crew Key Switch maintenance procedures disconnect electrical power from vehicle by switching off the battery cb (3q03).**

4-4.3.1.c Fault isolation

The Door Crew Key Switch Fault Isolation is included in Doors Fault Isolation procedure, refer to para 4-2.c**.**

4-4.3.1.d Disassembly

- **Reference Information.**
  1. Tools / Equipment.
     – MBTA Overhaul Standard Tools Kit.
  2. Material (Not Applicable).
- **Procedure**

There is no disassembly of the crew switch. The crew switch is replaced at overhaul, and is not repairable.

4-4.3.1.e Cleaning/Painting

- **Reference Information.**
  1. Tools / Equipment.
     – MBTA approved Cleaning Tools / Equipment (commercial).
  2. Material.
     – MBTA approved Cleaning Products (commercial) (Refer to Section 1 Table 1-9).

a) Cleaning

The switch is replaced at normal overhaul. If the switch is not to be replaced, clean the switch components as described in Table 4-4.15.

Table 4-4.15. Outside Crew Switch Cleaning Instructions

FIGURE AND ITEM	PART NAME	CLEANING METHODS AND MATERIALS
Figure 4-4.15-3	Switch cover and plate assembly	Clean the switch cover and plate assembly using a clean, lint-free cloth and a suitable solvent. Air blow dry and protect from corrosion.
-4	Crew switch	Moisten a clean, lint-free cloth with isopropyl alcohol and wipe the crew switch surfaces clean of accumulated dirt. Use a vacuum and a soft bristled brush to clean crevices and cavities.

b) Painting (Not applicable)

4-4.3.1.f Inspection

- **Reference Information.**
  1. Tools / Equipment (Not Applicable).
     – MBTA Carhouse Standard Tools Kit.
  2. Material (Not Applicable).

If the crew switch is not to be replaced automatically, inspect the switch components as described in Table 4-4.16**.**

Table 4-4.16. Outside Crew Switch Component Inspection Methods and Criteria

FIGURE AND ITEM	PART NAME	INSPECTION METHODS AND CRITERIA
Figure 4-4.14-3	Switch cover and plate assembly	Visually inspect the switch for wear, damage, and corrosion. Inspect the cover seals for deterioration. Make sure the cover spring holds the cover tightly closed. If the cover is worn, damaged, or deformed so that it doesn't seal, or the cover seal is damaged, or the cover spring does not keep the cover closed, replace the cover.

-4	Crew switch	Visually inspect for wear and damage. Inspect the switch face to make sure all markings are still egible. Operate the switch with the crew key to make sure that it operates smoothly, reaches all positions, and returns by spring force to the center position. Replace the switch if worn, damaged, illegible, or does not operate correctly.

4-4.3.1.g Repair (Not applicable)

4-4.3.1.h Reassembly

- **Reference Information.**
  1. Tools / Equipment.
     – MBTA Overhaul Standard Tools Kit.
  2. Material (Not Applicable).
- **Procedure**

  The outside crew switch is reassembled as part of installation as described in MM of this section

4-4.3.1.i Adjustment/Test

a) Adjustment

The outside crew switch requires no adjustment at installation on the car.

b) Test

i) On-Car Testing

The outside crew switch is tested on the car with the door system operational. Both the interior and the exterior crew switches are operated by the crew key in the same manner. Check each switch for proper operation as described in the procedure below.

1. Insert the crew key into the switch. For the exterior switch, this requires raising the spring-loaded door to gain access.
2. With power to the door operator, turn and hold the key clockwise to the OPEN (marked O) position. The door must open.
3. Turn and hold the key clockwise to the BRIDGEPLATE DEPLOY position (marked BP). The bridgeplate must deploy.
4. Release the key. The key must return to the centered position. The bridgeplate will continue to deploy.

5. Turn and hold the key counterclockwise to the CLOSE position (marked C). The bridgeplate must retract, and then the doors must close.

4-4.3.2 Bridge plate/door crew key switch

4-4.3.2.a Description and Operation

The vehicle (external vehicle) is equipped with four Bridgeplate / Door Crew Key Switches (Refer to Figure 4-4.15) installed near the Passenger Doors (A2, A3, B2, B3 Doors). The switch is used to open / close the related door and to deploy the bridgeplate, through four positions: CLOSE, NEUTRAL, OPEN and B.P. DEPLOY. The switch is protected with a hinged cover and to operate it is necessary the crew key.

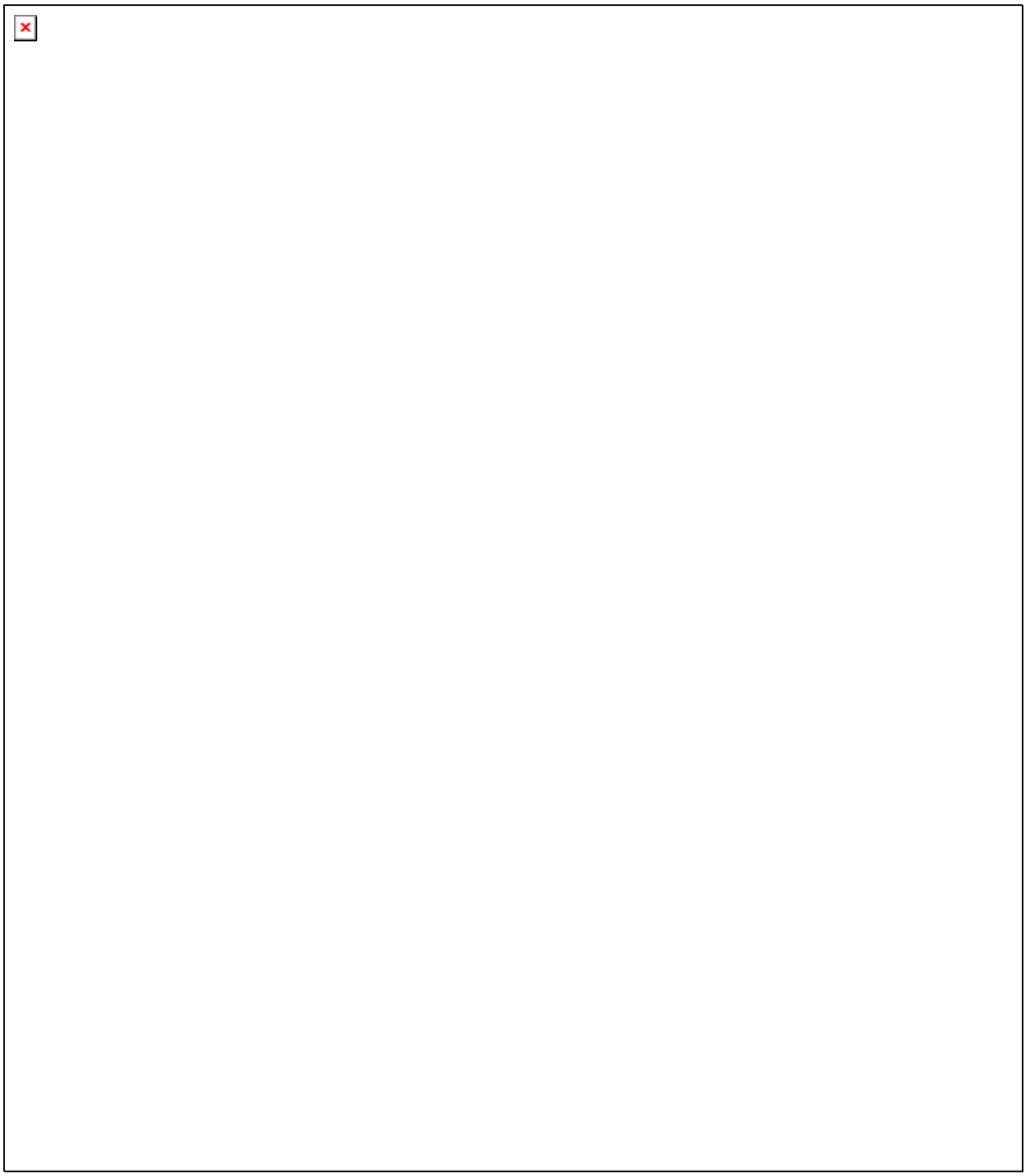


Figure 4-4.15 Bridgeplate / Door Crew Key Switch Location

4-4.3.2.b Specific Safety Precautions

> **WARNING: BEFORE PERFORMING BRIDGEPLATE / DOOR CREW KEY SWITCH MAINTENANCE PROCEDURES DISCONNECT ELECTRICAL POWER FROM VEHICLE BY SWITCHING OFF THE BATTERY CB (3Q03).**

4-4.3.2.c Fault Isolation

The Bridgeplate / Door Crew Key Switch Fault Isolation, is included in Doors Fault Isolation procedure, refer to para 4-2.c

4-4.3.2.d Disassembly (Not Aplicable)

There is no disassembly of the crew switch. The crew switch is replaced at overhaul, and is not repairable.

4-4.3.2.e Cleaning/Painting

a) Cleaning

> **WARNING: BEFORE PERFORMING BRIDGEPLATE / DOOR CREW KEY SWITCH CLEANING PROCEDURE DISCONNECT ELECTRICAL POWER FROM VEHICLE BY SWITCHING OFF THE BATTERY CB (3Q03).**

- **Reference Information.**
  1. Tools / Equipment.
     – MBTA approved Cleaning Tools / Equipment (commercial).
  2. Material.
     – MBTA approved Cleaning Products (commercial) (Refer to Section 1 Table 1-9).
- **Procedure.**

  To Clean each Bridgeplate / Door Crew Key Switch proceed as follows:

  1. Set the Vehicle in safety condition in accordance with MBTA Carhouse Regulations.
     – Switch OFF the Battery Circuit Breaker (CB 3Q03 – Battery Box).
  2. Using a maintenance key open the hinged cover that protects the switch.
  3. Clean and dry Crew Switch surface and hinged cover using mild detergent diluetd in water, brush and cleaning rags. (Refer to Table 1-9 for MBTA approved Cleaning Product List).

b) Painting (Not applicable)

4-4.3.2.f Inspection

> **WARNING: BEFORE PERFORMING BRIDGEPLATE / DOOR CREW KEY SWITCH INSPECTION PROCEDURE DISCONNECT ELECTRICAL POWER FROM VEHICLE BY SWITCHING OFF THE BATTERY CB (3Q03).**

- **Reference Information.**
  1. Tools / Equipment.
     – MBTA Carhouse Standard Tools Kit.
  2. Material (Not Applicable).
- **Procedure.**

  To Inspect each Bridgeplate / Door Crew Key Switch proceed as follows:

  1. Set the Vehicle in safety condition in accordance with MBTA Carhouse Regulations.
     – Switch OFF the Battery Circuit Breaker (CB 3Q03 – Battery Box).
  2. Inspect switch cover for cracks, otherwise damages and correct installation.
  3. Inspect switch for loose fasteners, or foreign material which may obstruct the switch keyhole. Repair or replace as required.
  4. Inspection results must be recorded on Defect Report Cards to allow the planning of Maintenance Operations.

4-4.3.2.g Repair (Not Applicable)

4-4.3.2.h Reassembly

- **Reference Information.**
  1. Tools / Equipment.
     – MBTA Overhaul Standard Tools Kit.
  2. Material (Not Applicable).
- **Procedure**

  The Bridge plate/door crew key switch is reassembled as part of installation as described in MM of this section

4-4.3.2.i Adjustment /test

a) Adjustment (Not Applicable)

b) Test

The Bridgeplate / Door Crew Key Switch Test, is included in Doors Test procedure, refer to para 4-2.ib).

4-4.3.3 Bridgeplate Request Pushbutton

4-4.3.3.a Description and Operation

The vehicle (external vehicle) is equipped with four Bridgeplate Request Pushbuttons (Refer to Figure 4-4.16) installed near the Passenger Doors (A2, A3, B2, B3 Doors). The pushbutton is used from the passenger to ask for bridgeplate deployment.

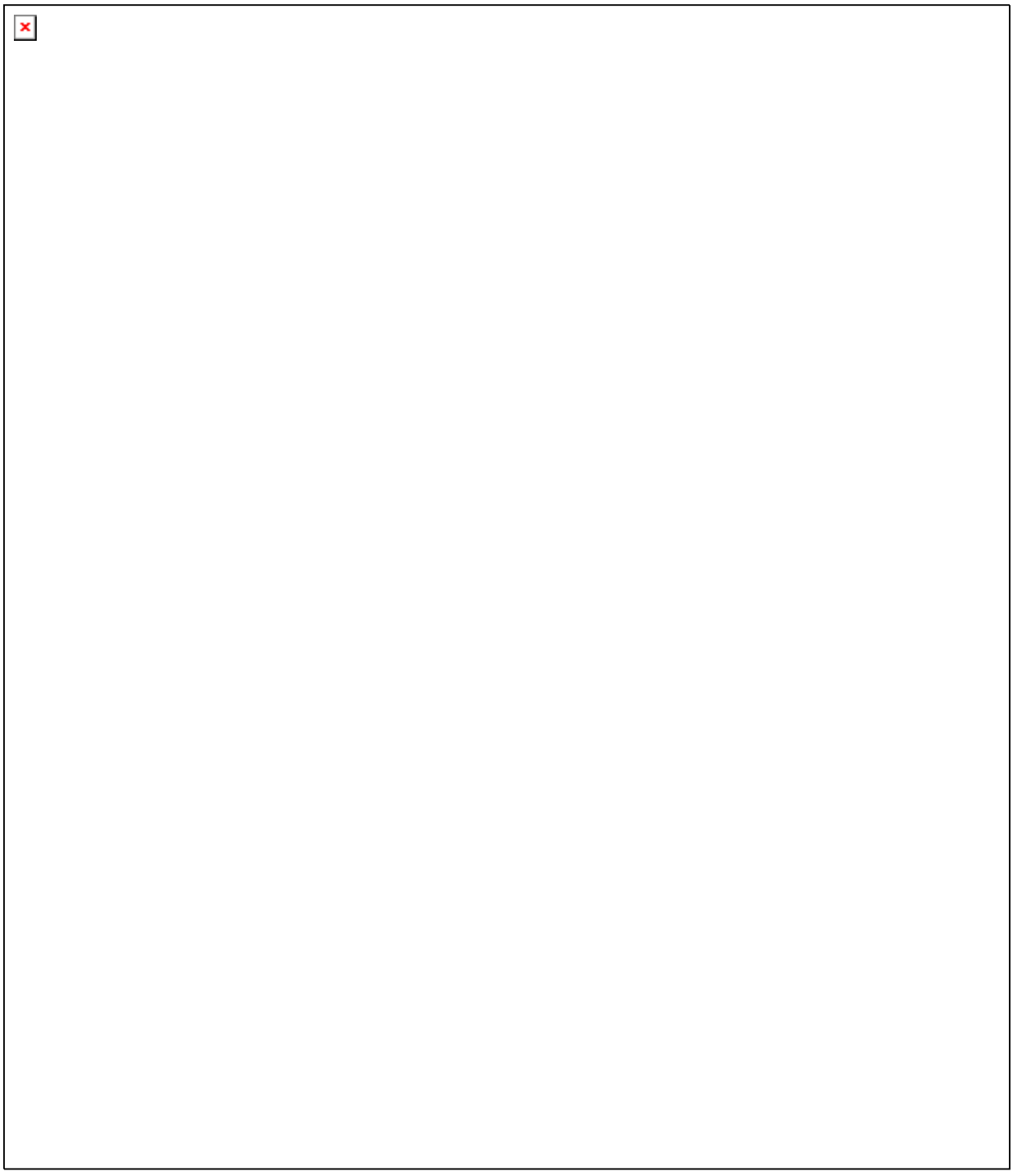


Figure 4-4.16 Bridgeplate Request Pushbutton Location

4-4.3.3.b Specific Safety Precautions

WARNING:	**BEFORE PERFORMING BRIDGEPLATE REQUEST PUSHBUTTON MAINTENANCE PROCEDURES DISCONNECT ELECTRICAL POWER FROM VEHICLE BY SWITCHING OFF THE BATTERY CB (3Q03).**

4-4.3.3.c Fault Isolation

The Bridgeplate Request Pushbutton Fault Isolation/Repair, is included in Doors Fault Isolation/Repair procedure, refer to para 4-2.c.

4-4.3.3.d Disassembly

- **Reference Information.**
  1. Tools / Equipment.
     – MBTA Overhaul Standard Tools Kit.
  2. Material (Not Applicable).
- **Procedure**

There is no disassembly of the Bridgeplate Request Pushbutton The Bridgeplate Request Pushbutton is replaced at overhaul, and is not repairable.

4-4.3.3.e Cleaning/Painting

a) Cleaning

WARNING:	**BEFORE PERFORMING BRIDGEPLATE REQUEST PUSHBUTTON CLEANING PROCEDURE DISCONNECT ELECTRICAL POWER FROM VEHICLE BY SWITCHING OFF THE BATTERY CB (3Q03).**

- **Reference Information.**
  1. Tools / Equipment.
     – MBTA approved Cleaning Tools / Equipment (commercial).
  2. Material.
     – MBTA approved Cleaning Products (commercial) (Refer to Section 1 Table 1-9).

- **Procedure.**

  To Clean each Bridgeplate Request Pushbutton proceed as follows:

  1. Set the Vehicle in safety condition in accordance with MBTA Carhouse Regulations.
     – Switch OFF the Battery Circuit Breaker (CB 3Q03 – Battery Box).
  2. Clean and dry Bridgeplate Request Pushbutton surface using mild detergent diluetd in water, brush and cleaning rags. (Refer to Table 1-9 for MBTA approved Cleaning Product List).

b) Painting (Not Applicable)

4-4.3.3.f Inspection

WARNING:	**BEFORE PERFORMING BRIDGEPLATE REQUEST PUSHBUTTON INSPECTION PROCEDURE DISCONNECT ELECTRICAL POWER FROM VEHICLE BY SWITCHING OFF THE BATTERY CB (3Q03).**

- **Reference Information.**
  1. Tools / Equipment.
     – MBTA Carhouse Standard Tools Kit.
  2. Material (Not Applicable).
- **Procedure.**

  To Inspect each Bridgeplate Request Pushbutton proceed as follows:

  1. Set the Vehicle in safety condition in accordance with MBTA Carhouse Regulations.
     – Switch OFF the Battery Circuit Breaker (CB 3Q03 – Battery Box).
  2. Inspect pushbutton for cracks, otherwise damages and correct installation,
  3. Inspect pushbutton for foreign material which may interfere with the proper operation of the pushbutton. Repair or replace as required.
  4. Inspection results must be recorded on Defect Report Cards to allow the planning of Maintenance Operations.

4-4.3.3.g Repair (Not Applicable)

4-4.3.3.h Reassembly

The Bridgeplate Request Pushbutton is reassembled as part of installation as described in MM of this section

4-4.3.3.i Adjustment/Test

a) Adjustment (Not Applicable)

b) Test

The External Emergency Door Release Handle Test, is included in Doors Test procedure, refer to para 4-2.ib).

4-4.3.4 External Emergency Door Release Handle

4-4.3.4.a Description and Operation

The vehicle (external vehicle) is equipped with two External Emergency Door Release Handle (Refer to Figure 4-4.17) located near the Operator Doors (A1, B1 Doors). The handle is activated for the Emergency Opening of the A1 and B1 Doors. Pulling the handle the related door will be unlock allowing the door to be open by hand. The handle is secured with a cover accessible from the authorized personnel only through the crew key.

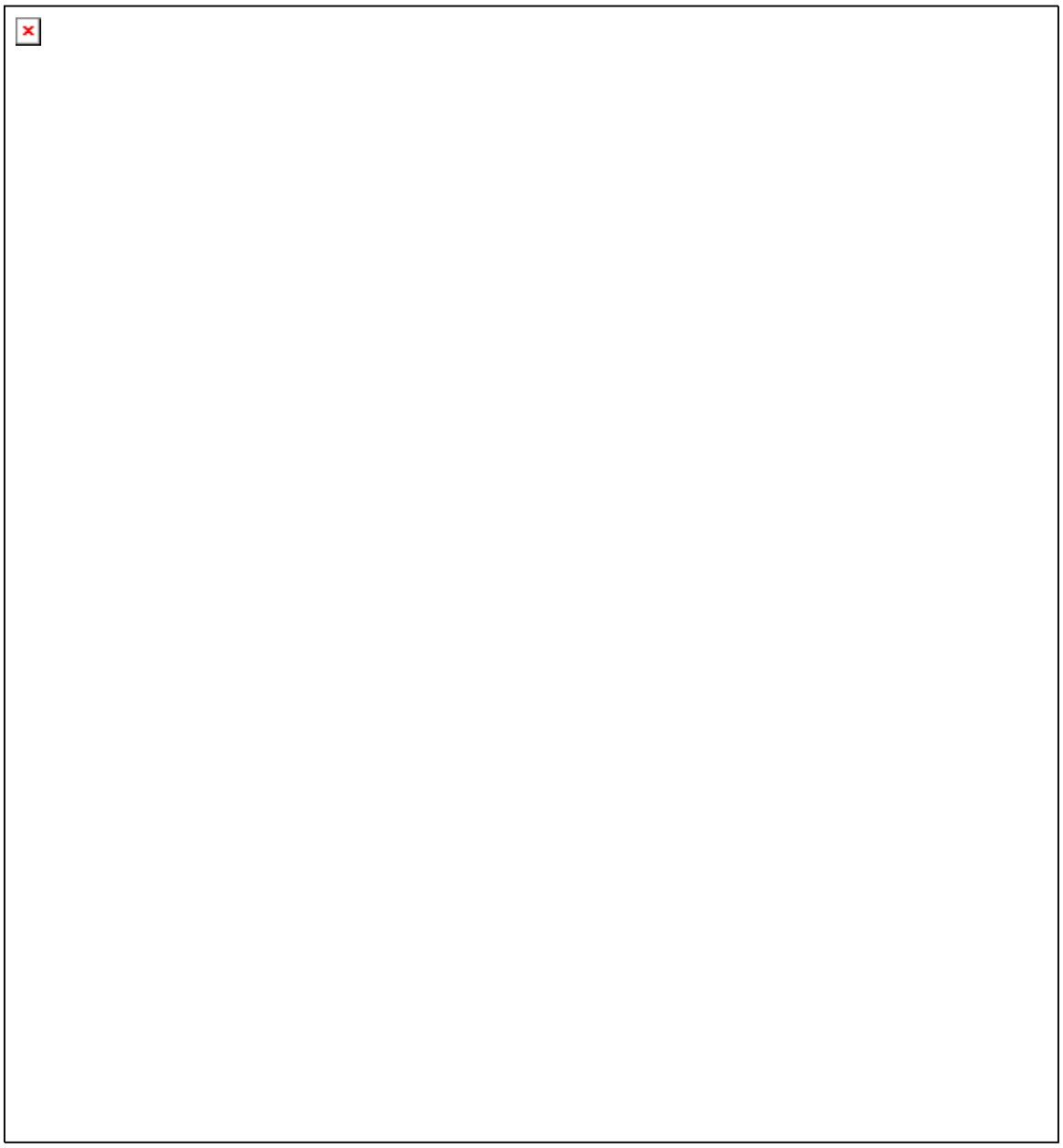


Figure 4-4.17 External Emergency Door Release Handle Location

4-4.3.4.b Specific Safety Precautions

> **WARNING: BEFORE PERFORMING EXTERNAL EMERGENCY DOOR RELEASE HANDLE MAINTENANCE PROCEDURES DISCONNECT ELECTRICAL POWER FROM VEHICLE BY SWITCHING OFF THE BATTERY CB (3Q03).**

4-4.3.4.c Fault Isolation

The External Emergency Door Release Handle Fault Isolation is included in Doors Fault Isolation procedure, refer to para 4-2.c.

4-4.3.4.d Disassembly

- **Reference Information.**
  1. Tools / Equipment.
     – MBTA Overhaul Standard Tools Kit.
  2. Material (Not Applicable).
- **Procedure**

There is no disassembly of the External Emergency Door Release Handle. The External Emergency Door Release Handle is replaced at overhaul, and is not repairable.

4-4.3.4.e Cleaning/Painting

> **WARNING: BEFORE PERFORMING EXTERNAL EMERGENCY DOOR RELEASE HANDLE CLEANING PROCEDURE DISCONNECT ELECTRICAL POWER FROM VEHICLE BY SWITCHING OFF THE BATTERY CB (3Q03).**

a) Cleaning

- **Reference Information.**
  1. Tools / Equipment.
     – MBTA approved Cleaning Tools / Equipment (commercial).
  2. Material.
     – MBTA approved Cleaning Products (commercial) (Refer to Section 1 Table 1-9).

- **Procedure.**

  To Clean each External Emergency Door Release Handle proceed as follows:

  1. Set the Vehicle in safety condition in accordance with MBTA Carhouse Regulations.
     – Switch OFF the Battery Circuit Breaker (CB 3Q03 – Battery Box).
  2. Using a maintenance key open hinged cover.
  3. Clean and dry handle and cover surface using mild detergent diluetd in water, brush and cleaning rags. (Refer to Table 1-9 for MBTA approved Cleaning Product List).

b) Painting (Not Applicable)

4-4.3.4.f Inspection

WARNING:	**BEFORE EXTERNAL EMERGENCY DOOR RELEASE HANDLE INSPECTION PROCEDURE DISCONNECT ELECTRICAL POWER FROM VEHICLE BY SWITCHING OFF THE BATTERY CB (3Q03).**

- **Reference Information.**
  1. Tools / Equipment.
     – MBTA Carhouse Standard Tools Kit.
  2. Material (Not Applicable).
- **Procedure.**

  To Inspect each External Emergency Door Release Handle proceed as follows:

  1. Set the Vehicle in safety condition in accordance with MBTA Carhouse Regulations.
     – Switch OFF the Battery Circuit Breaker (CB 3Q03 – Battery Box).
  2. Using a maintenance key open hinged cover.
  3. Inspect handle for cracks, otherwise damages and correct installation.
  4. Inspect hinged cover and related lock for cracks, otherwise damages and correct installation.
  5. Inspection results must be recorded on Defect Report Cards to allow the planning of Maintenance Operations.

4-4.3.4.g Repair (Not Applicable)

4-4.3.4.h Reassembly

- **Reference Information.**
  1. Tools / Equipment.
     – MBTA Overhaul Standard Tools Kit.
  2. Material (Not Applicable).
- **Procedure**

  The External Emergency Door Release Handle is reassembled as part of installation as described in MM of this section

4-4.3.4.i Adjustment/Test

a) Adjustment (Not Applicable)

b) Test

The External Emergency Door Release Handle Test, is included in Doors Test procedure, refer to para 4-2.ib).

4-4.3.5 Door OPEN / CLOSE Warning Light

4-4.3.5.a Description and Operation

The vehicle (external vehicle) is equipped with six Door OPEN / CLOSE Warning Light (red) (Refer to Figure 4-4.18) located above each door (A1, A2, A3, B1, B2, B3 Doors), when lit it indicates that the related door is open or unlocked. Each light turn on automatically when the doors are opened and turn off when the doors are closed. For Door OPEN / CLOSE Warning Light Description, Operation and the Maintenance procedure, refer to Section 6 of this Manual.

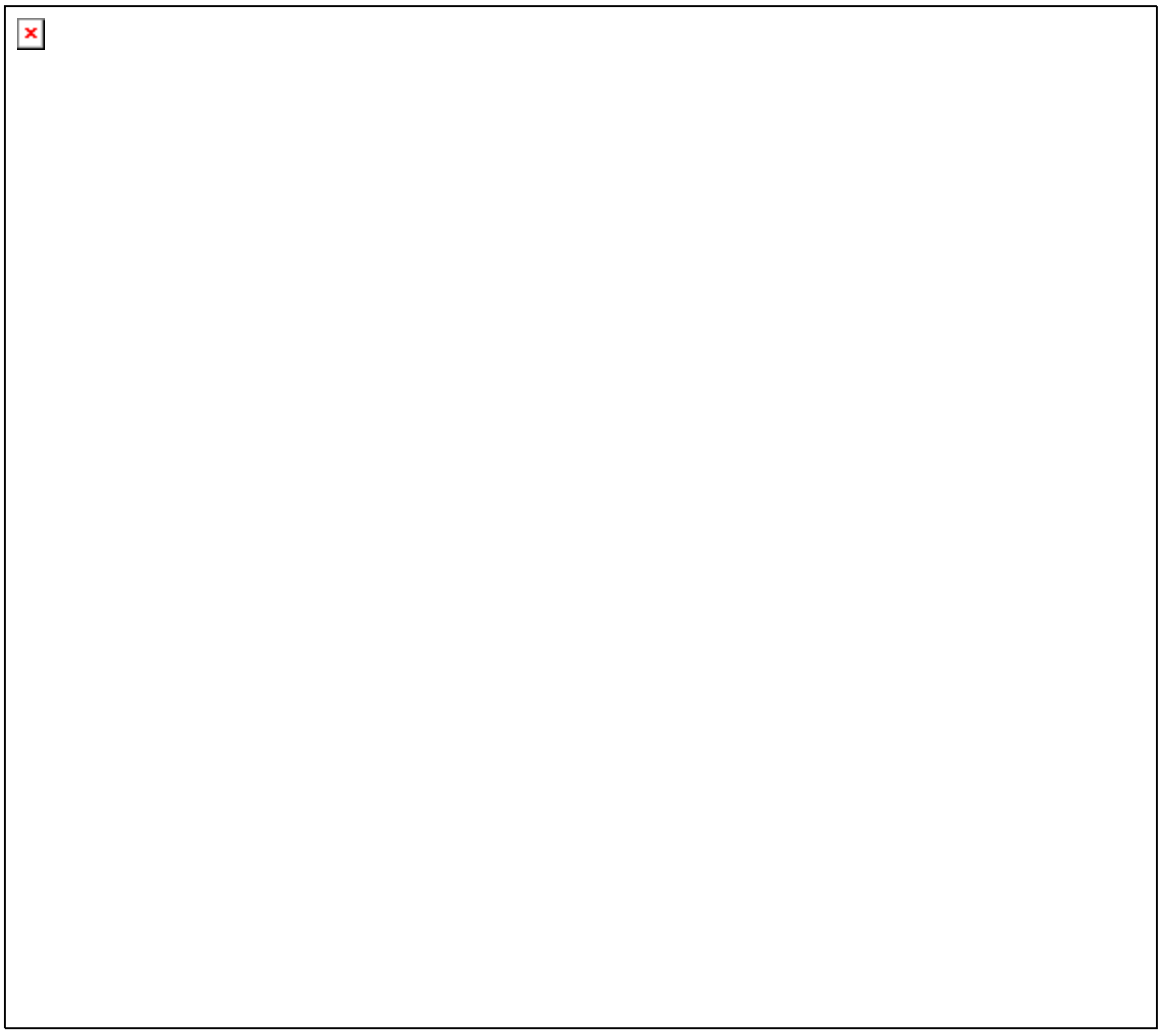


Figure 4-4.18 Door OPEN / CLOSE Warning Light Location

4-4.3.6 Door OUT-OF-SERVICE Indicator Light

4-4.3.6.a Description and Operation

The vehicle (external vehicle) is equipped with six Door OUT-OF-SERVICE Indicator Light (red) (Refer to Figure 4-4.19) located above each door (A1, A2, A3, B1, B2, B3 Doors), when lit it indicates the DOOR OUT OF SERVICE. For Door OUT-OF-SERVICE Indicator Light Description, Operation and the Maintenance procedure, refer to Section 6 of this Manual.

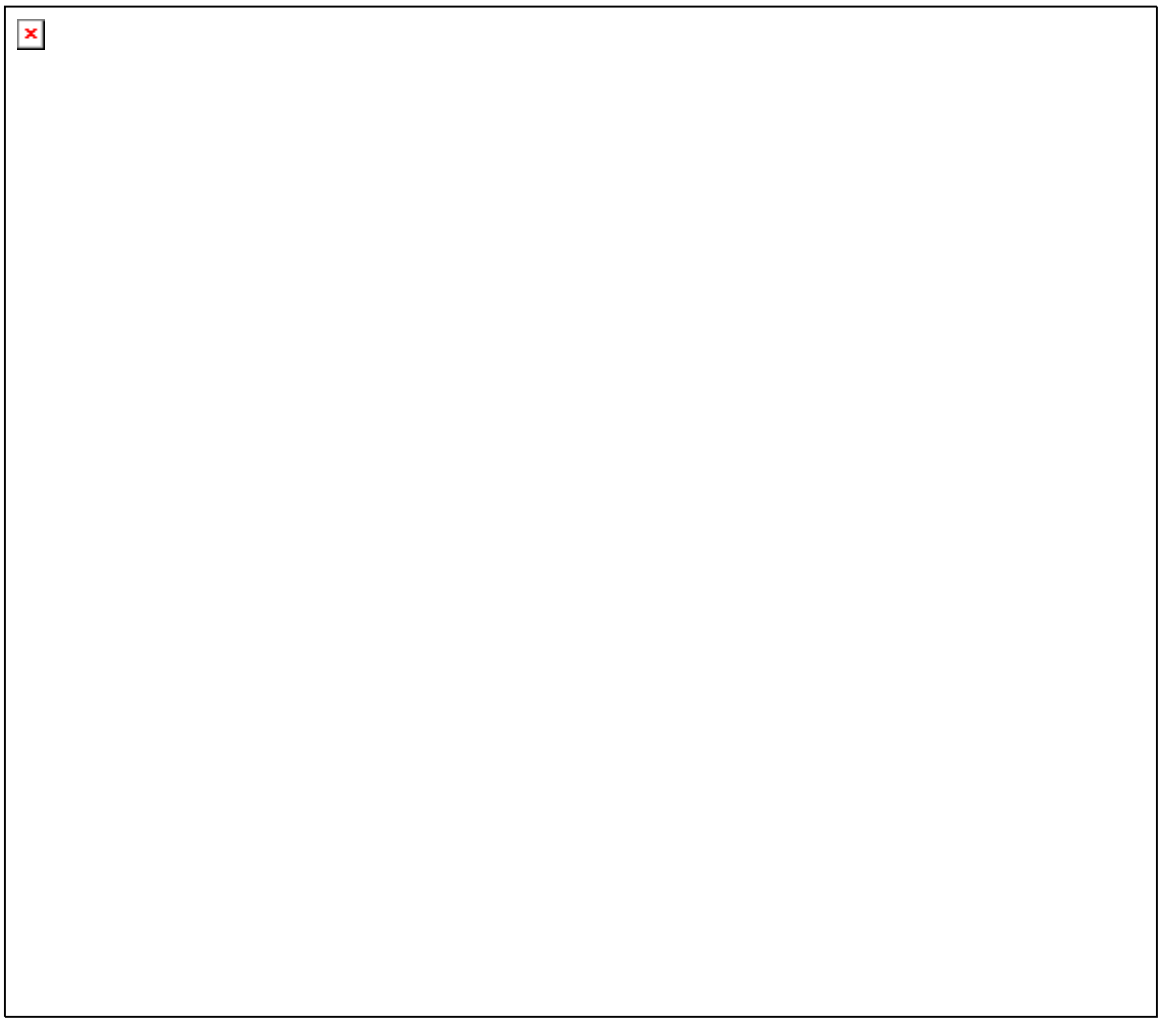


Figure 4-4.19 Door OUT-OF-SERVICE Indicator Light Location

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SCHEDULED MAINTENANCE FOR THE DOOR SYSTEM AND COMPONENTS

5-1 Door System Scheduled Maintenance

Scheduled maintenance for the door system and its components is defined in the subsections and tables below. A separate scheduled maintenance table is provided for each of the components or group of components listed below.

- Passenger pushbutton- Table 5-1
- Outside crew switch- Table 5-12
- Inside crew switch- Table 5-13
- Manual release handle and manual release cable-Table 5-14
- Linkage- Table 5-15
- Controller, Relay Assembly, and Mounting Bracket- Table 5-16 (comprises the door control module, the relay panel assembly, the wiring harness, and the mounting bracket)
- Door Operator- Table 5-17
- Doors- Table 5-18
- Bridgeplate- Table 5-19
- Three month functional check- Table 5-10

5-1.1 Passenger Pushbutton

Perform scheduled maintenance on the passenger pushbutton according to the schedule and procedures provided in Table 5-1, and the note and procedures following the table.

Table 5-1 Passenger Pushbutton-Scheduled Maintenance

COMPONENT	MAINTENANCE INTERVAL	MAINTENANCE ACTION	MAINTENANCE METHODS AND MATERIALS
Passenger Pushbutton	90, 180, 270, and 360 days	Clean the passenger pushbutton.	Moisten a clean, lint-free cloth with isopropyl alcohol and wipe the crew switch surfaces clean of accumulated dirt. Use a vacuum and a soft bristled brush to clean crevices and cavities.

COMPONENT	MAINTENANCE INTERVAL	MAINTENANCE ACTION	MAINTENANCE METHODS AND MATERIALS
		After cleaning the passenger pushbutton, inspect it visually.	Visually inspect for wear and damage. Also inspect the switch face to make sure all markings are still legible Replace the switch if worn, damaged, or illegible.
		Operate the passenger pushbutton.	Check the pushbutton operation according to paragraph 5-1.1.1.

5-1.1.1 On-Car Testing of the Passenger Pushbutton

The pushbutton switch is tested on the car with the door system operational.

1. Press the passenger pushbutton. The green LEDs on the passenger pushbutton must illuminate.
2. As the doors open and the bridgeplate deploys and then retracts, the green LEDs must flash.
3. Place the bridgeplate out-of-service switch on the door operator to BYPASS. The red LEDs on the passenger pushbutton must illuminate

5-1.2 Outside Crew Switch

Perform scheduled maintenance on the outside crew switch according to the schedule and procedures provided in Table 5-12 , and the note and procedures following the table.

Table 5-12 Outside Crew Switch-Scheduled Maintenance

COMPONENT	MAINTENANCE INTERVAL	MAINTENANCE ACTION	MAINTENANCE METHODS AND MATERIALS
Outside Crew Switch	90, 180, 270, and 360 days	Clean the outside crew switch.	Moisten a clean, lint-free cloth with isopropyl alcohol and wipe the crew switch surfaces clean of accumulated dirt. If necessary, use a vacuum and a soft bristled brush to clean crevices and cavities. Clean the switch cover using a clean, lint-free cloth and a suitable solvent. Air blow dry and protect from corrosion.
		After cleaning the crew switch, inspect it visually.	Check the spring loaded switch cover. The cover must remain tightly closed when the cover is released. Check for damage and deformation. Make sure the threaded fasteners are intact and secure.
		Hand operate the crew switch.	Check the switch operation according to paragraph 5-1.2.1.

5-1.2.1 On-Car Testing of the Outside Crew Switch

The outside crew switch is tested on the car with the door system operational. Both the interior and the exterior crew switches are operated by the crew key in the same manner. Check each switch for proper operation as described in the procedure below.

1. Insert the crew key into the switch. For the exterior switch, this requires raising the spring-loaded door to gain access.
2. With power to the door operator, turn and hold the key clockwise to the OPEN (marked O) position. The door must open.
3. Turn and hold the key clockwise to the BRIDGEPLATE DEPLOY position (marked BP). The bridgeplate must deploy.
4. Release the key. The key must return to the centered position. The bridgeplate will continue to deploy.
5. Turn and hold the key counterclockwise to the CLOSE position (marked C). The bridgeplate must retract, and then the doors must close.

5-1.3 Inside Crew Switch

Perform scheduled maintenance on the inside crew switch according to the schedule and procedures provided in Table 5-13, and procedures following the table.

Table 5-13. Inside Crew Switch-Scheduled Maintenance

COMPONENT	MAINTENANCE INTERVAL	MAINTENANCE ACTION	MAINTENANCE METHODS AND MATERIALS
Inside Crew Switch	90, 180, 270, and 360 days	Clean the inside crew switch.	Moisten a clean, lint-free cloth with isopropyl alcohol and wipe the crew switch surfaces clean of accumulated dirt. If necessary, use a vacuum and a soft bristled brush to clean crevices and cavities.
		After cleaning the crew switch, inspect it visually.	Check for damage and deformation. Make sure the threaded fasteners are intact and secure.
		Hand operate the crew switch.	Check the switch operation according to paragraph 5-1.3.1.

5-1.3.1 On-Car Testing of the Inside Crew Switch

The inside crew switch is tested on the car with the door system operational. Both the interior and the exterior crew switches are operated by the crew key in the same manner. Check each switch for proper operation as described in the procedure below.

1. Insert the crew key into the switch. For the exterior switch, this requires raising the spring-loaded door to gain access.
2. With power to the door operator, turn and hold the key clockwise to the OPEN (marked O) position. The door must open.
3. Turn and hold the key clockwise to the BRIDGEPLATE DEPLOY position (marked BP). The bridgeplate must deploy.
4. Release the key. The key must return to the centered position. The bridgeplate will continue to deploy.
5. Turn and hold the key counterclockwise to the CLOSE position (marked C). The bridgeplate must retract, and then the doors must close.

5-1.4 Manual Release Handle and Manual Release Cable

Perform scheduled maintenance on the manual release handle and cable according to the schedule and procedures provided in Table 5-14, and the procedures following the table.

Table 5-14. Manual Release Handle-Scheduled Maintenance

COMPONENT	MAINTENANCE INTERVAL	MAINTENANCE ACTION	MAINTENANCE METHODS AND MATERIALS
Manual Release Handle	90, 180, 270, and 360 days	Clean the manual release handle and manual release housing.	Moisten a clean, lint-free cloth with a nonvolatile, residue free solvent and wipe the manual release handle and its housing surfaces clean of accumulated dirt. If necessary, use a vacuum and a soft bristled brush to clean crevices and cavities.
		After cleaning the manual release handle and housing, inspect it visually.	Check for damage and deformation. Make sure the housing is securely mounted. Check the handle to make sure it remains secure in the stowed position.

COMPONENT	MAINTENANCE INTERVAL	MAINTENANCE ACTION	MAINTENANCE METHODS AND MATERIALS
		Hand operate the manual release handle and mechanism.	Operate the manual release mechanism through the manual release handle according to paragraph 5-1.4.1.
Manual Release Cable	90, 180, 270, and 360 days	The cable is located in the car sidewall and is not cleaned during the periodic maintenance cycles. The cable is located in the car sidewall and is not inspected during the periodic maintenance cycles.	
		The manual release cable is tested at the same time the handle mechanism is tested.	Operate the manual release mechanism through the manual release handle according to paragraph 5-1.4.1. This also checks the manual release cable.

5-1.4.1 On-Car Testing of the Manual Release Handle and Cable

With the car doors prepared for operation, actuate the manual release handle. Check the operation of the manual release mechanism as follows:

1. Verify that the doors release and can be opened by hand.
2. Fully open the car doors.
3. Close the car doors and reset the manual release handle manually.
4. Verify that the doors are completely closed, and that the correct door and train operating signals are present.

5-1.5 Door Linkage Components

Perform scheduled maintenance on the door linkage components according to the schedule and procedures provided in Table 5-15.

Table 5-15. Door Linkage Components-Scheduled Maintenance

COMPONENT	MAINTENANCE INTERVAL	MAINTENANCE ACTION	MAINTENANCE METHODS AND MATERIALS
Connecting rods at the door operator teeter plate and at the door lever.	90, 180, 270, and 360 days	Clean the connecting rods.	Using a clean, lint-free cloth, wipe the connecting rod, the rod end bearing, and the teeter plate drive pin surfaces clean of accumulated dirt. If it is necessary to use a solvent, use it sparingly, and do not allow solvent on the spherical bearings If necessary, use a vacuum and a soft bristled brush to clean crevices and cavities.
		After cleaning the connecting rods and attachment points, inspect them visually.	Check for damage and deformation. Make sure the connecting rods are securely attached at the drive pins. Check for corrosion.
		Grasp the connecting rods by hand. Attempt to move them longitudinally, and twist them upward and downward.	No longitudinal movement with respect to the drive pins is allowed. The connecting rods must twist slightly on their spherical bearings. If either spherical bearing is seized, the connecting rod must be removed and repaired.
		Check the jam nuts on the connecting rods	The jam nuts must be tightly locked to the adjustment coupling and/or the connecting rod body, as appropriate. If a nut is not locked, tighten it to the torque value provided in

COMPONENT	MAINTENANCE INTERVAL	MAINTENANCE ACTION	MAINTENANCE METHODS AND MATERIALS
			section 4 of this manual.
Door lever		Clean the door levers.	Using a clean, lint-free cloth, wipe the door lever surfaces clean of accumulated dirt. If it is necessary to use a solvent, use it sparingly, and do not allow solvent on the connecting rod spherical bearings nor on the door lever spline shaft. If necessary, use a vacuum and a soft bristled brush to clean crevices and cavities.
	90, 180, 270, and 360 days	After cleaning the door levers, inspect them visually.	Check for damage and deformation. Make sure the connecting rods are securely attached at the door lever drive pins. Check for corrosion.
		Grasp the door levers by hand. Attempt to move them vertically, and attempt to rotate them around the spline axis.	The door levers must be tight on the spline shafts. No vertical movement with respect to the spline is allowed. The connecting rod must fit tightly to the spline shaft. No play between the door lever spline and the spline shaft is allowed. If there is movement, tighten the screw and wedges. If these cannot be tightened enough to remove the play, either or both spline components must be replaced.

5-1.6 Controller, Relay Assembly, and Mounting Bracket

Perform scheduled maintenance on the controller, relay assembly, and mounting bracket according to the schedule and procedures provided in Table 5-16.

Table 5-16. Controller, Relay Assembly, and Mounting Bracket-Scheduled Maintenance

COMPONENT	MAINTENANCE INTERVAL	MAINTENANCE ACTION	MAINTENANCE METHODS AND MATERIALS
Door control module	90, 180, 270, and 360 days	Clean the door control module exterior.	Using a clean, lint-free cloth, wipe the exterior surfaces of the door control module clean. If necessary, moisten the cloth with isopropyl alcohol. Use it sparingly, and do not allow the alcohol to enter the door control module case or any component. If necessary, use a vacuum and a soft bristled brush to clean crevices and cavities.
		Inspect the door control module.	Inspect the door control module case for evidence of physical damage. Inspect all mountings. The mountings must be secure. Check all connectors. The connectors must be fully inserted and secure. Check that all labeling is present and legible. Check the LED display on the front of the door control module. All LEDs must be functional. With the door system powered, operate the door system through the controller.
			As the door control module operates, check the LEDs visible through the windows on the controller front. Make sure each

COMPONENT	MAINTENANCE INTERVAL	MAINTENANCE ACTION	MAINTENANCE METHODS AND MATERIALS
			LED illuminates at the correct points in the operational cycle. If any of the door control module LEDs do not illuminate, remove and replace the door control module.
Relay Assembly	90, 180, 270, and 360 days	Clean the relay assembly.	Remove power from the relay panel assembly. Using a clean, lint-free cloth, wipe the exterior surfaces of the components clean. If necessary, use a vacuum and a soft bristled brush to clean crevices and cavities.
		Inspect the relay assembly.	Check all components for damage. Check all mounting hardware. The mounting hardware must be secure. Check all terminal connections. The terminal connections must be secure, and show no evidence of arcing. Check all wiring. The insulation must show no evidence of damage or deterioration. Replace damaged or deteriorating wiring.
		Check door control	Verify operation of the door control module

COMPONENT	MAINTENANCE INTERVAL	MAINTENANCE ACTION	MAINTENANCE METHODS AND MATERIALS
		module and relay panel operation.	and the relay panel as part of the door system test procedures in section 4-4. If the door system passes the test, the door control module and the relay panel components are functioning properly.
Wiring Harness	90, 180, 270, and 360 days	Clean the wiring harness.	Clean the wiring harness with a clean, lint- free cloth. If necessary, moisten the cloth with isopropyl alcohol. Use it sparingly, and do not allow the alcohol to enter the ends of the harness. If necessary, use a vacuum and a soft bristled brush to clean crevices around the wiring harness terminations.
		Inspect the wiring harness	Check the insulation on all wires and the harness for evidence of overheating, which is evident by discoloration. Check for brittle insulation. If any wires or the wiring harness have hardened, discolored insulation, the wires or harness must be replaced. Check the wires and harness for evidence of electrical leakage (arcing) through the insulation. Highly localized discoloration and insulation breakdown is evidence of arcing.

5-1.7 Door Operator and Wiring Harness

Perform scheduled maintenance on the door operator and wiring harness according to the schedule and procedures provided in Table 5-17, and the notes and procedures following the table.

Table 5-17. Door Operator and Wiring Harness-Scheduled Maintenance

COMPONENT	MAINTENANCE INTERVAL	MAINTENANCE ACTION	MAINTENANCE METHODS AND MATERIALS
Door Operator	90, 180, 270, and 360 days	Clean the door operator and components.	Using a clean, lint-free cloth, wipe the exterior surfaces of the door operator and components. If necessary, use a vacuum and a soft bristled brush to clean crevices and cavities. If necessary, clean the mechanical components with a cloth moistened with an approved, nonvolatile, residue free solvent. If necessary, clean the electronic components with a cloth moistened with isopropyl alcohol.

COMPONENT	MAINTENANCE INTERVAL	MAINTENANCE ACTION	MAINTENANCE METHODS AND MATERIALS
		Inspect the door operator and components.	Inspect the components for evidence of physical damage. Inspect all component mountings. The mountings must be secure. Check all connectors. The connectors must be fully inserted and secure. Check all terminal connections. The terminal connections must be secure, and show no evidence of arcing.
Door Operator Emergency Release Mechanism	90, 180, 270, and 360 days	Inspect the door operator emergency release mechanism.	Check that the cable attachment to the release mechanism is intact, and that the locking pin that secures the clevis pin is in good condition.
			Check for corrosion, especially where the cable attaches to the clevis and where it enters the cable housing. Even slight corrosion is cause for rejection of the emergency release cable.
		Check the operation of the door operator emergency release mechanism.	Operate the emergency release mechanism as described in paragraph 5-1.7.1.
Door Out-of-Service Assembly	90, 180, 270, and 360 days	Check the operation of the door out-of-service assembly.	Operate the door out-of-service assembly as described in paragraph 5-1.7.2.
Wiring Harness	90, 180, 270, and 360 days	Clean the wiring harness.	Clean the wiring harness with a clean, lint- free cloth. If necessary, moisten the cloth with isopropyl alcohol. Use it sparingly, and do not allow the

COMPONENT	MAINTENANCE INTERVAL	MAINTENANCE ACTION	MAINTENANCE METHODS AND MATERIALS
			alcohol to enter the ends of the harness. If necessary, use a vacuum and a soft bristled brush to clean crevices around the wiring harness terminations.
		Inspect the wiring harness	Check the insulation on all wires and the harness for evidence of overheating, which is evident by discoloration. Check for brittle insulation. If any wires or the wiring harness have hardened, discolored insulation, the wires or harness must be replaced. Check the wires and harness for evidence of electrical leakage (arcing) through the insulation. Highly localized discoloration and insulation breakdown is evidence of arcing.

5-1.7.1 On-Car Testing of the Emergency Release Lever

Operate the emergency actuation lever. The lever must move smoothly, and remain locked over center until it is returned to the normal position by hand.

1. Verify that the doors release and can be opened by hand.
2. Fully open the car doors.
3. Close the car doors and reset the manual release handle and the emergency release handle on the door operator manually.
4. Verify that the doors are completely closed, and that the correct door and train operating signals are present.

5-1.7.2 On-Car Testing of the Door Out-of-Service Assembly

1. Actuate the door out-of-service mechanism. Operate it, making sure the mechanism operates smoothly, remains locked in the actuated position, and actuates the door out-of-service switch.
2. Verify that the door out-of-service lights illuminate.
3. Provide a DOOR OPEN signal to the doors. Verify that the doors do not open.

5-1.8 Door Assembly

Perform scheduled maintenance on the door assembly according to the schedule and procedures provided in Table 5-18, and the procedures following the table.

Table 5-18. Door Assembly-Scheduled Maintenance

COMPONENT	MAINTENANCE INTERVAL	MAINTENANCE ACTION	MAINTENANCE METHODS AND MATERIALS
Door Assembly	90, 180, 270, and 360 days	Clean the door assembly.	Using a clean, lint-free cloth moistened with a nonvolatile, residue free solvent, wipe the exterior surfaces of the door panels. Clean the upper and lower door guide components using a clean, lint-free cloth moistened with a nonvolatile, residue free solvent. If necessary, use a vacuum and a soft bristled brush to clean crevices and cavities. Clean the windows using commercially available window cleaning fluid and clean, lint-free cloths. Clean the door seals using a mild soap and water solution and clean, lint-free cloths.
		Inspect the door components.	Inspect the components for evidence of physical damage. Inspect all component mountings. The mountings must be secure. Inspect the door mounting and guide components. The doors must be securely mounted. There can be no play in the pivots, hinges, and guide components.
			Check the door panel alignment. The door panels

COMPONENT	MAINTENANCE INTERVAL	MAINTENANCE ACTION	MAINTENANCE METHODS AND MATERIALS
			must align when closed, with the seals providing good weathertight sealing. The sensitive edge seals must meet and seal correctly. Visually inspect the door panels for damage and deformation. If the door panels are damaged or deformed, check that the doors operate, seal, and lock correctly. Inspect the window glass for hazing and cracking. The windows must be free of cracks, and must not be losing transparency because of scratching, hazing, or material deterioration.
		Check the door operation manually.	Operate the doors by hand as described in paragraph 5-1.8.1.

5-1.8.1 On-Car Testing of the Door Assembly

Perform a manual test of the doors as described below.

1. Release the doors using the emergency release handle.
2. Push the doors open by hand.
3. The doors must operate smoothly, with no evidence of catching or binding.
4. The doors must open completely, so that the bumpers at the inside top center of each door contact at the open position.
5. Close the doors by hand. Closing must also be smooth, with no evidence of catching or binding.
6. Return the emergency release handle to the NORMAL operating position. The doors must close completely, and reach the overcenter position.

5-1.9 Bridgeplate Assembly

Perform scheduled maintenance on the bridgeplate assembly according to the schedule and procedures provided in Table 5-19, and the procedures following the table.

Table 5-19. Bridgeplate Assembly-Scheduled Maintenance

COMPONENT	MAINTENANCE INTERVAL	MAINTENANCE ACTION	MAINTENANCE METHODS AND MATERIALS
Bridgeplate Assembly	90, 180, 270, and 360 days	Clean the bridgeplate assembly.	Deploy the bridgeplate ramp. Clean the bridgeplate ramp using a detergent and water solution and a stiff-bristled brush. Dry the bridgeplate ramp with lint-free cloths. Retract the bridgeplate ramp.
		Inspect the bridgeplate exterior	Visually inspect the bridgeplate nose and the ramp traction surface. If the bridgeplate nose shows excessive wear, replace it. If the ramp traction surface no longer provides good traction, replace it.
		Check the bridgeplate operation.	Functionally check the operation of the bridgeplate as part of the system functional check in section 5-1.8.1.
	Annually	Clean the bridgeplate components.	With the car at a maintenance facility, drop the bridgeplate bottom cover and clean the bridgeplate components. Using a clean, lint-free cloth, wipe the exterior surfaces of the bridgeplate components. If necessary, use a vacuum and a soft bristled brush to clean crevices

COMPONENT	MAINTENANCE INTERVAL	MAINTENANCE ACTION	MAINTENANCE METHODS AND MATERIALS
			and cavities.
			If necessary, clean the mechanical components with a cloth moistened with a nonvolatile, residue free solvent. If necessary, clean the electronic components with a cloth moistened with isopropyl alcohol. Clean and lubricate the ballscrew and ballnut according to the instructions in paragraph 5-1.9.1.
		Inspect the bridgeplate components	Inspect the components for evidence of physical damage. Inspect all component mountings. The mountings must be secure. Inspect the ballscrew and ball nut for evidence of wear. Release the deployed locks and slide the ramp inward and outward to check the movement of the ballnut/ballscrew combination. The movement must feel free, and be free of catching, binding, and unusual noise. Check all connectors. The connectors must be fully inserted and secure. Check all terminal connections. The terminal connections must be secure, and show no evidence of arcing.
		Lubricate the bridgeplate ballscrews.	Clean and lubricate the ballscrews according to the instructions in paragraph 5-1.9.1.

5-1.9.1 Cleaning and Lubricating the Ballscrews

Clean and lubricate the ballscrews and ballnuts as described below. Refer to Figure 4-2.73

1. Deploy the bridgeplate and remove power from the bridgeplate.
2. Clean the exposed threaded area on each ballscrew using a clean, lint-free cloth moistened with a non-flammable solvent. Make sure the threads are completely cleaned of lubricant and any contaminants.

CAUTION: DO NOT USE ANY DRY LUBRICANTS ON THE BALLSCREWS. USE A LIGHTWEIGHT, LITHIUM-BASED LUBRICANT

3. Lubricate the ballscrews with a light coating of a lightweight lithium-based grease. Use 2 to 5 cubic centimeters of grease. Spread the grease evenly over the entire exposed screw thread.

NOTE: Do not over lubricate the ballscrew. The ballscrew requires only light lubrication to provide smooth operation and to protect it from wear

4. Restore power to the bridgeplate and drive it to the stowed position. Remove the power from the bridgeplate.
5. Cut and remove the harness ties at the outboard end of each bellows. Push the bellows inboard to expose the end of the ballscrew that was not exposed with the bridgeplate deployed.
6. Clean the exposed threaded area on each ballscrew using a clean, lint-free cloth moistened with a non-flammable solvent. Make sure the threads are completely cleaned of lubricant and any contaminants.
7. Complete the lubrication of the ballscrews with a light coating of a lightweight lithium-based grease. Spread the grease evenly over the entire exposed screw thread.
8. Refer to Figure 4-2.70 Reposition the bellows over the front bellows brackets and secure them with harness ties

5-1.10 Door System Three Month Functional Check

At three month intervals, verify the door system function according to Table 5-10 and the test procedures listed in Table 5-10.

Table 5-10. Door System-Scheduled Performance Verification

COMPONENT	MAINTENANCE INTERVAL	MAINTENANCE ACTION	MAINTENANCE METHODS AND MATERIALS
Passenger Pushbutton	90, 180, 270, and 360 days	Ninety day functional verification	Check the pushbutton function according to paragraph 5-1.1.1.
Outside Crew Switch	90, 180, 270, and 360 days	Ninety day functional verification	Check the switch operation according to paragraph 5-1.2.1.
Inside Crew Switch	90, 180, 270, and 360 days	Ninety day functional verification	Check the switch operation according to paragraph 5-1.3.1.
Emergency Handle and Emergency Cable	90, 180, 270, and 360 days	Ninety day functional verification	Operate the manual release mechanism through the manual release handle according to paragraph 5-1.4.1. This also checks the manual release cable.
Door Linkage	90, 180, 270, and 360 days	Ninety day functional verification	The function of the door linkage components is verified during the operational check of the door system components.
Controller and Wiring Harness	90, 180, 270, and 360 days	Ninety day functional verification	Verify the system function according to the test procedure in paragraph 4-4.
Door Operator	90, 180, 270, and 360 days	Ninety day functional verification	Verify the system function according to the test procedure in paragraph 4-4. Also perform the sensitive edge test in paragraph 4.4.4
Door Assembly	90, 180, 270, and 360 days	Ninety day functional verification	Verify the system function according to the test procedure in paragraph 5-1.1.1.
Bridgeplate Assembly	90, 180, 270, and 360 days	Ninety day functional verification	Verify the system function according to the test procedure in paragraph 5-1.1.1.

5-1.11 Door System Testing

5-1.11.1 Instrumentation

The following items are required to functionally test each door module assembly:

- Variable power supply
- Test fixture (if available) to support door module assembly
- Flat solid bar measuring 0.38 inch (9.5 mm) thick and 3 inches (76 mm) wide
- A 0.75 inch (19 mm) diameter solid rod
- P.T.U. (Portable Test Unit) (refer to Maintenance Manual)

5-1.11.2 Pretest Preparation

NOTE: Follow this step only if the train is without power.

1. Attach the module assembly and the stabilizing fixture to the test stand.
2. Connect variable power supply to the door control module. Set voltage to 37.5 volts.
3. Manually open and close the doors. Verify that the doors move freely without any binding or interference with test fixture.

5-1.11.3 Door Open and Close Speed Check *

1. Place doors in the fully closed and locked position.
2. Command the doors to open and measure the time.
3. Verify that the time required for the doors to reach their full open position is 2.5 ± 0.2 seconds.
4. With the doors in the full open position, command the doors to close and measure the time.
5. Verify that the time required for the doors to reach their fully closed position is 3.0 ± 0.2 seconds.
6. Set the variable power supply voltage to 24 VDC and repeat above steps.

5-1.11.4 Obstruction Detection Test

1. Open the doors.
2. Command the doors to close. As the doors begin to close insert the 3 X 3/8 inch (76 x 9.5 mm) test bar (so that the 3 “ face of the flat bar meets the door panel edge) along the line where the door panel edges mesh. Insert the test bar anywhere along the length of the edges except for the upper most 3 inches (76-mm) and lower most 1 inch (25-mm) of the door panel edge. Repeat this three times at locations near the top, middle, and bottom.

3. The doors should recycle open after encountering the obstruction.
4. Repeat above steps using the 0.75 inch (19 mm) diameter test bar.

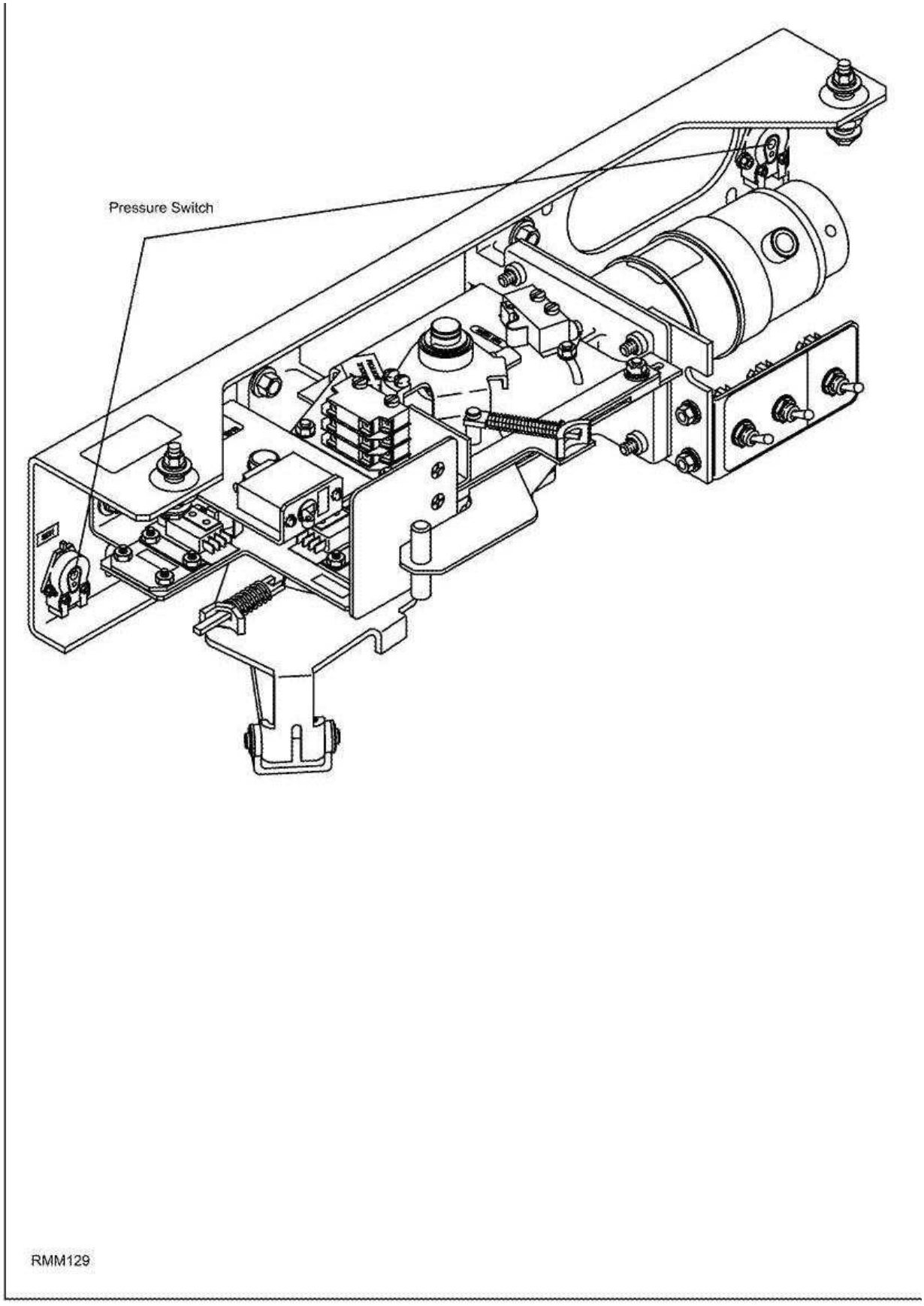

Figure 5-1.1. Pressure Switch

5. Check for proper sensitivity of the sensitive edge (Left and Right). To obtain the proper obstruction detection turn the pressure wave switch knob left or right (refer to Figure 5-1.1). Adjust the pressure wave switch knob until the proper sensitivity is achieved (previous steps are passed). With the door panels open, push the close button and apply a small amount of pressure on the sensitive edge of each door panel or use the gauge block described in the previous steps to ensure that the pressure wave switch of each door leaf functions as intended. (Do not disconnect any of the pressure wave switches to test obstruction detection and verify a "single point failure").
6. Adjust the pressure wave switch as follows (only tool required is a screwdriver):

- If it is too sensitive, (the door recycles without an obstruction), decrease the sensitivity of the pressure wave switch by turning clockwise with a screwdriver for approximately one-quarter turn.
- If it is not_sensitive_enough, (the pressure wave switch does not detect one of the specified obstacles), increase the sensitivity of the pressure wave switch by turning counter clockwise with a screwdriver for approximately one-quarter turn.

7. If necessary repeat previous two steps.
8. Measure the force applied by the doors on an obstruction with the sensitive edges functioning. To do this, first command the doors to open. Place a force gauge (approximately 9" to 10" in overall length) at the center of the opening. The shaft end of the force gauge should have a 1" x 1" (25 x 25 mm) block attached to it. Command the doors to close against the force gauge. One door will strike the square block and the other will strike the opposite end of the force gauge. Position the force gauge so that the doors strike the gauge simultaneously.
9. The maximum force measured should not exceed 35 lb.

5-1.12 Bridgeplate Testing

1. Retract and deploy several times to verify smooth operation. Ensure that a platform is present, seven to eight inches above the top of the rail (it could be replaced with a support set at a convenient height, placed at a proper distance).
2. Command the bridgeplate to fully deploy. Turn OFF the bridgeplate motor power and interlock switches located on the door operator assembly.
3. Actuate the manual unlock levers to release the ramp.
4. Manually place the ramp in a horizontal position. Measure the force required to manually stow the ramp using a force gauge. The force required to manually stow the ramp should not exceed 45 lb.

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MAINTENANCE SCHEDULES FOR THE DOOR SYSTEM AND COMPONENTS

6-1 Door System Maintenance Schedules

Maintenance for the door system and its components is scheduled at three month intervals, with specific bridgeplate maintenance actions scheduled annually. A maintenance schedule table based on the maintenance period is provided in this section.

Table 6-1. Maintenance Schedule

MAINTENANCE INTERVAL	COMPONENT	MAINTENANCE ACTION	MAINTENANCE METHODS AND MATERIALS
90, 180, 270, and 360 days	Passenger Pushbutton	Clean the passenger pushbutton.	Moisten a clean, lint-free cloth with isopropyl alcohol and wipe the crew switch surfaces clean of accumulated dirt. Use a vacuum and a soft bristled brush to clean crevices and cavities.
		After cleaning the passenger pushbutton, inspect it visually.	Visually inspect for wear and damage. Also inspect the switch face to make sure all markings are still legible Replace the switch if worn, damaged, or illegible.
		Operate the passenger pushbutton.	Check the pushbutton operation according to paragraph 5-1.1.1.
90, 180, 270, and 360 days	Outside Crew Switch	Clean the outside crew switch.	Moisten a clean, lint-free cloth with isopropyl alcohol and wipe the crew switch surfaces clean of accumulated dirt.
90, 180, 270, and 360 days	Outside Crew Switch (continued)	Clean the outside crew switch.	If necessary, use a vacuum and a soft bristled brush to clean crevices and cavities.

MAINTENANCE INTERVAL	COMPONENT	MAINTENANCE ACTION	MAINTENANCE METHODS AND MATERIALS
			Clean the switch cover using a clean, lint- free cloth and a suitable solvent. Air blow dry and protect from corrosion.
		After cleaning the crew switch, inspect it visually.	Check the spring loaded switch cover. The cover must remain tightly closed when the cover is released. Check for damage and deformation. Make sure the threaded fasteners are intact and secure.
		Hand operate the crew switch.	Check the switch operation according to paragraph 5-1.2.1.
90, 180, 270, and 360 days	Inside Crew Switch	Clean the inside crew switch.	Moisten a clean, lint-free cloth with isopropyl alcohol and wipe the crew switch surfaces clean of accumulated dirt. If necessary, use a vacuum and a soft bristled brush to clean crevices and cavities.
		After cleaning the crew switch, inspect it visually.	Check for damage and deformation. Make sure the threaded fasteners are intact and secure.
		Hand operate the crew switch.	Check the switch operation according to paragraph 5-1.3.1.
90, 180, 270, and 360 days	Manual Release Handle	Clean the manual release handle and manual release housing.	Moisten a clean, lint-free cloth with a nonvolatile, residue free solvent and wipe the manual release handle and its housing surfaces clean of accumulated dirt. If necessary, use a vacuum and a soft bristled brush to clean crevices and cavities.
90, 180, 270, and	Manual Release	After cleaning the	Check for damage and

MAINTENANCE INTERVAL	COMPONENT	MAINTENANCE ACTION	MAINTENANCE METHODS AND MATERIALS
360 days	Handle	manual release handle and housing, inspect it visually.	deformation. Make sure the housing is securely mounted. Check the handle to make sure it remains secure in the stowed position.
		Hand operate the manual release handle and mechanism.	Operate the manual release mechanism through the manual release handle according to paragraph 5-1.4.1.
90, 180, 270, and 360 days	Manual Release Cable	Cleaning-the cable is located in the car sidewall and is not cleaned during the periodic maintenance cycles.	
		Inspection-the cable is located in the car sidewall and is not inspected during the periodic maintenance cycles.	
		Testing-the manual release cable is tested at the same time the handle mechanism is tested.	Operate the manual release mechanism through the manual release handle according to paragraph 5-1.4.1. This also checks the manual release cable.
90, 180, 270, and 360 days	Connecting rods at the door operator teeter plate and at the door lever	Clean the connecting rods.	Using a clean, lint-free cloth, wipe the connecting rod, the rod end bearing, and the teeter plate drive pin surfaces clean of accumulated dirt. If it is necessary to use a solvent, use it sparingly, and do not allow solvent on the spherical bearings

MAINTENANCE INTERVAL	COMPONENT	MAINTENANCE ACTION	MAINTENANCE METHODS AND MATERIALS
			If necessary, use a vacuum and a soft bristled brush to clean crevices and cavities.
90, 180, 270, and 360 days	Connecting rods at the door operator teeter plate and at the door lever	After cleaning the connecting rods and attachment points, inspect them visually.	Check for damage and deformation. Make sure the connecting rods are securely attached at the drive pins. Check for corrosion.
		Grasp the connecting rods by hand. Attempt to move them longitudinally, and twist them upward and downward.	No longitudinal movement with respect to the drive pins is allowed. The connecting rod must twist slightly on their spherical bearings. If either spherical bearing is seized, the connecting rod must be removed and repaired.
		Check the jam nuts on the connecting rods	The jam nuts must be tightly locked to the adjustment coupling and/or the connecting rod body, as appropriate. If a nut is not locked, tighten it to the torque value provided in section 4 of this manual.
90, 180, 270, and 360 days	Door lever	Clean the door levers.	Using a clean, lint-free cloth, wipe the door lever surfaces clean of accumulated dirt. If it is necessary to use a solvent, use it sparingly, and do not allow solvent on the spherical bearings nor on the door lever spline shaft. If necessary, use a vacuum and a soft bristled brush to clean crevices and cavities.
90, 180, 270, and 360 days	Door lever	After cleaning the door levers, inspect them visually.	Check for damage and deformation. Make sure the connecting rods are securely attached at the door lever drive

MAINTENANCE INTERVAL	COMPONENT	MAINTENANCE ACTION	MAINTENANCE METHODS AND MATERIALS
			pins. Check for corrosion.
90, 180, 270, and 360 days	Door lever	Grasp the door levers by hand. Attempt to move them vertically, and attempt to rotate them around the spline axis.	The door levers must be tight on the spline shafts. No vertical movement with respect to the spline is allowed. The connecting rod must fit tightly to the spline shaft. No play between the door lever spline and the spline shaft is allowed. If there is movement, tighten the screw and wedges. If these cannot be tightened enough to remove the play, either or both spline components must be replaced.
90, 180, 270, and 360 days	Door control module	Clean the door control module exterior.	Using a clean, lint-free cloth, wipe the exterior surfaces of the door control module clean. If necessary, moisten the cloth with isopropyl alcohol. Use it sparingly, and do not allow the alcohol to enter the door control module case or any component. If necessary, use a vacuum and a soft bristled brush to clean crevices and cavities.
90, 180, 270, and 360 days	Door control module	Inspect the door control module.	Inspect the components for evidence of physical damage. Inspect all mountings. The mountings must be secure. Check all connectors. The connectors must be fully inserted and secure. Check that all labeling is present and legible. Check the LED display on the front of the door control module. All LEDs must be functional.

MAINTENANCE INTERVAL	COMPONENT	MAINTENANCE ACTION	MAINTENANCE METHODS AND MATERIALS
			With the door system powered, operate the door system through the controller.
90, 10, 270, and 360 days	Door control module	Inspect the door control module.	As the door control module operates, check the LEDs visible through the windows on the controller front. Make sure that each LED illuminates at the correct points in the operational cycle. If any of the door control module LEDs do not illuminate, remove and replace the door control module.
90, 180, 270, and 360 days	Relay Assembly	Clean the relay assembly.	Remove power from the relay panel assembly. Using a clean, lint-free cloth, wipe the exterior surfaces of the components clean. If necessary, use a vacuum cleaner and a soft bristled brush to clean crevices and cavities.
90, 180, 270, and 360 days	Relay Assembly	Inspect the relay assembly.	Check all components for damage. Check all mounting hardware. The mounting hardware must be secure. Check all terminal connections. The terminal connections must be secure, and show no evidence of arcing. Check all wiring. The insulation must show no evidence of damage or deterioration. Replace damaged or deteriorating wiring.
90, 180, 270, and 360 days	Door Control Module and	Check door control module	Verify operation of the door control module and the relay

MAINTENANCE INTERVAL	COMPONENT	MAINTENANCE ACTION	MAINTENANCE METHODS AND MATERIALS
	Relay Assembly	and relay panel operation.	panel as part of the door system test procedures in section 4-4. If the door system passes the test, the door control module and the relay panel components are functioning properly.
90, 180, 270, and 360 days	Wiring Harness	Clean the wiring harness.	Clean the wiring harness with a clean, lint-free cloth. If necessary, moisten the cloth with isopropyl alcohol. Use it sparingly, and do not allow the alcohol to enter the ends of the harness. If necessary, use a vacuum and a soft bristled brush to clean crevices around the wiring harness terminations.
90, 180, 270, and 360 days	Wiring Harness	Inspect the wiring harness	Check the insulation on all wires and the harness for evidence of overheating, which is evident by discoloration. Check for brittle insulation. If any wire or the wiring harness has hardened, discolored insulation, the wires or harness must be replaced. Check the wires and harness for evidence of electrical leakage (arcing) through the insulation. Highly localized discoloration and insulation breakdown is evidence of arcing.
90, 180, 270, and 360 days	Door Operator	Clean the door operator and components.	Using a clean, lint-free cloth, wipe the exterior surfaces of the door operator and components. If necessary, use a vacuum and a soft bristled brush to clean crevices and cavities. If necessary, clean the mechanical components with a

MAINTENANCE INTERVAL	COMPONENT	MAINTENANCE ACTION	MAINTENANCE METHODS AND MATERIALS
			cloth moistened with an approved, nonvolatile, residue free solvent. If necessary, clean the electronic components with a cloth moistened with isopropyl alcohol.
90, 180, 270, and 360 days	Door Operator	Inspect the door operator and components.	Inspect the components for evidence of physical damage. Inspect all component mountings. The mountings must be secure. Check all connectors. The connectors must be fully inserted and secure. Check all terminal connections. The terminal connections must be secure, and show no evidence of arcing.
90, 180, 270, and 360 days	Door Operator Emergency Release Mechanism	Inspect the door operator emergency release mechanism.	Check that the cable attachment to the release mechanism is intact, and that the locking pin that secures the clevis pin is in good condition. Check for corrosion, especially where the cable attaches to the clevis and where it enters the cable housing. Even slight corrosion is cause for rejection of the emergency release cable.
90, 180, 270, and 360 days	Door Operator Emergency Release Mechanism	Check the operation of the door operator emergency release mechanism.	Operate the emergency release mechanism as described in paragraph 5-1.7.1.
90, 180, 270, and 360 days	Door Out-of-Service Assembly	Check the operation of the door out-of-service assembly.	Operate the door out-of-service assembly as described in paragraph 5-1.7.2.

MAINTENANCE INTERVAL	COMPONENT	MAINTENANCE ACTION	MAINTENANCE METHODS AND MATERIALS
90, 180, 270, and 360 days	Door Operator Wiring Harness	Clean the wiring harness.	Clean the wiring harness with a clean, lint- free cloth. If necessary, moisten the cloth with isopropyl alcohol. Use it sparingly, and do not allow the alcohol to enter the ends of the harness. If necessary, use a vacuum and a soft bristled brush to clean crevices around the wiring harness terminations.
90, 180, 270, and 360 days	Wiring Harness	Inspect the wiring harness	Check the insulation on all wires and the harness for evidence of overheating, which is evident by discoloration. Check for brittle insulation. If any wires or the wiring harness have hardened, discolored insulation, the wires or harness must be replaced. Check the wires and harness for evidence of electrical leakage (arcing) through the insulation. Highly localized discoloration and insulation breakdown is evidence of arcing.
90, 180, 270, and 360 days	Door Assembly	Clean the door assembly.	Using a clean, lint-free cloth moistened with a nonvolatile, residue free solvent, wipe the exterior surfaces of the door panels.
			Clean the upper and lower door guide components using a clean, lint-free cloth moistened with a nonvolatile, residue free solvent.
			If necessary, use a vacuum and a soft bristled brush to clean crevices and cavities.
90, 180, 270, and 360 days	Door Assembly	Clean the door assembly.	Clean the windows using commercially available window cleaning fluid and clean, lint-free

MAINTENANCE INTERVAL	COMPONENT	MAINTENANCE ACTION	MAINTENANCE METHODS AND MATERIALS
			cloths.
			Clean the door seals using a mild soap and water solution and clean, lint-free cloths.
90, 180, 270, and 360 days	Door Assembly	Inspect the door components.	Inspect the components for evidence of physical damage. Inspect all component mountings. The mountings
			must be secure. Inspect the door mounting and guide components. The doors must be securely mounted. The can be no play in the pivots, hinges, and guide components. Check the door panel alignment. The door panels must align when closed, with the seals providing good weathertight sealing. The sensitive edge seals must meet and seal correctly. Visually inspect the door panels for damage and deformation. If the door panels are damaged or deformed, check that the doors operate, seal, and lock correctly. Inspect the window glass for hazing and cracking. The windows must be free of cracks, and must not be losing transparency because of scratching, hazing, or material deterioration.
90, 180, 270, and 360 days	Door Assembly	Check the door operation manually.	Operate the doors by hand as described in paragraph 5-1.8.1.
90, 180, 270, and 360 days	Bridgeplate Assembly	Clean the bridgeplate assembly.	Deploy the bridgeplate ramp. Clean the bridgeplate ramp using a detergent and water solution

MAINTENANCE INTERVAL	COMPONENT	MAINTENANCE ACTION	MAINTENANCE METHODS AND MATERIALS
			and a stiff- bristled brush. Dry the bridgeplate ramp with lint-free cloths. Retract the bridgeplate ramp.
90, 180, 270, and 360 days	Bridgeplate Assembly	Inspect the bridgeplate exterior.	Visually inspect the bridgeplate nose and the ramp traction surface. If the bridgeplate nose shows excessive wear, replace it. If the ramp traction surface no longer provides good traction, replace it.
90, 180, 270, and 360 days	Bridgeplate Assembly	Check the bridgeplate operation.	Functionally check the operation of the bridgeplate as part of the system functional check in section 6-1.
Annually	Bridgeplate assembly	Clean the bridgeplate components.	With the car at a maintenance facility, drop the bridgeplate bottom cover and clean the bridgeplate components. Using a clean, lint-free cloth, wipe the exterior surfaces of the bridgeplate components. If necessary, use a vacuum and a soft bristled brush to clean crevices and cavities. If necessary, clean the mechanical components with a cloth moistened with a nonvolatile, residue free solvent. If necessary, clean the electronic components with a cloth moistened with isopropyl alcohol. Clean and lubricate the ballscrew and ballnut according to the instructions in paragraph 5-1.9.1.
Annually	Bridgeplate assembly	Inspect the bridgeplate	Inspect the components for evidence of physical damage.

MAINTENANCE INTERVAL	COMPONENT	MAINTENANCE ACTION	MAINTENANCE METHODS AND MATERIALS
		components	Inspect all component mountings. The mountings must be secure. Inspect the ballscrew and ball nut for evidence of wear. Release the deployed locks and slide the ramp inward and outward to check the movement of the ballnut/ballscrew combination. The movement must feel free, and be free of catching, binding, and unusual noise.
Annually	Bridgeplate Assembly	Inspect the bridgeplate components	Check all connectors. The connectors must be fully inserted and secure. Check all terminal connections. The terminal connections must be secure, and show no evidence of arcing.
Annually	Bridgeplate Assembly	Lubricate the bridgeplate ballscrews.	Clean and lubricate the ballscrews according to the instructions in paragraph 5-1.9.1.

7. APPENDIX A

VERIFICATION, INSTALLATION AND ADJUSTMENT PROCEDURE FOR VAPOR DOOR EQUPMENT, DOOR MODULES, P/N: 59566657 AND 59566658, BRIDGEPLATES P/N: 59566659 AND 59566659-01

DOCUMENT: 200410485 Rev. 5

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* Only for initial installation/major repair.

NOTES:

All the hardware with a specified torque value in this procedure must be torqued to the required torque value and torque marked. During this procedure all hardware will be tightened (finger tight + 1turn). All the specified torque values must be implemented once this procedure is entirely completed.

All the hardware affected by this procedure must be new hardware (ie: all the fastening devices and washers) and must be secured with Loctite 242 if not otherwise specified.

All the hardware not mentioned in this procedure but affected by this procedure must be torqued and marked as per Vapor's Torque Table, document number 94-1-122 (attached in ANNEX) and / or as per relevant drawings if not otherwise specified.

During this procedure check for improper harness routing. Add the necessary quantity of tie-wraps to secure the harness and to prevent any rubbing or chaffing (check: circuit breaker, terminal block, motor, linkage arms, etc.).

All chapters, paragraphs and steps followed by an * are mentioned only for installation or major repair purpose. These chapters, paragraphs and steps must be applied only during installation or after major repairs, which affect the door system.

Fill out the appropriated boxes in the Checklist (copy attached in ANNEX).

1.0 DOOR SYSTEM ADJUSTMENT PROCEDURE

1.1.0 Door Alignment – Closed Position

1.1.1 Before attempting to adjust the door alignment, verify that all adjustable components are mounted in their nominal positions, i.e., these components include;
- Sub shaft and bracket assembly – in the center of the bearing bracket openings
- Lower pivot brackets – approximately centered
- Bottom stabilizing wedge brackets – approximately centered
- Upper roller brackets – approximately centered
- Guide tracks – approximately centered
- Center door threshold brackets – in the lowest position
- End door threshold brackets – approximately centered

Note *:
Maximum allowable height difference between two adjacent panels is 0.187" (3/16"). If two adjacent panels present a bigger height difference, add a round spacer (one spacer is alreadyinstalled), Vapor p/n 56810305-12, on the lowest panel (for location see picture 20). Also check that there is clearance between the bottom of the door panel and the hex-head of the pivot bracket (see picture 19)

1.1.2 Manually place the teeter lever in the locked over center position. [Door closed and locked].
Outside of the car, measure the width at the top of the door opening (See dimension “A” on picture 1). Subtract 6 inches and then divide by 2 (X = (A-6”)/2). Adjust the door panel so that the distance from the metal leading edge to its respective portal edge at the top of the opening
is the same as the distance calculated above (“X”). To adjust for the correct gap on the top, loosen the four nuts securing each bearing plate to the header extrusion. Move the bearing plate or plates as required in the forward/aft directions. The panels may be opened slightly, for easier adjustment. Secure the mounting fasteners and verify the gap at the top. Re-adjust as
required. On the opposite side, close and lock the door panel. Adjust this panel so that the metal leading edge is at the same distance from its respective portal edge at the top of the opening as the one on the opposite side. Close and lock both panels and measure the distance between the metal leading edges of the door panels at the top. It should be between 5-15/16 in. and 6-1/16 in. If not, than readjust the door panels so that this distance is between 5-15/16 in. and 6-1/16 in. This adjustment should be evenly distributed between both panels.
The point where the rubber leading edge seals meet will not be in the exact center of the clear door opening. Outside of the car measure the width of the bottom of the clear door opening (See Picture 2, dimension “B”). Subtract 6 inches and then divide by 2. Close and lock the door panel. To adjust the gap at the bottom, loosen the bottom pivot mounting nut and position the pivot as required, in the forward/aft direction. The panels may be opened slightly for easier adjustment. Secure the mounting nut after verifying the gap adjustment
On the opposite side, close and lock the panel. Use the same procedure as previously described to set the panel metal leading edge at the same distance from its respective portal edge at the bottom of the
opening as the opposite side. Close and lock both panels and measure the distance between the metal leading edges of the door panels at the bottom. It should also be between 5-15/16 in. to 6-1/16 in. If not, then readjust the door panels so that this distance is between 5-15/16 in. to
6-1/16 in. This distance should be the same along the entire length of the door panel. (The distance from portal edge to metal leading edge should be the same for both panels at the top and the same for both panels at the bottom. The distance from portal edge to metal leading edge at the top may be different from the distance at the bottom for the same door panel due to variances in the car portal opening.)

1.1.3 Manually place the teeter lever in the locked over center position [Door closed and locked].
Measure the distance at the top, center, and bottom of the opening between the door panel leading edges (metal). This distance should be 6.00 ± .06 inches [152.4 ± 1.5 mm].

1.1.4 Check the top seals contact between the inside surface of the door panels and the seal itself. To check the contacts use a gauge (plastic or metallic tool with dimensions 2” x 3” x 0.015 inches). The working side of the tool is 2” X 0.015”.

The rubber gasket should be compressed to the point where you start to feel enough resistance but before the plastic / metallic tool starts to bend (see picture 3). To adjust the upper corner seal gap loosen the four nuts, securing each bearing plate to the header extrusion. Move the bearing plate or plates, as required in the inboard/outboard directions. Tighten the mounting fasteners and verify the seal gap(s) at the top corners of the opening only. Check an area 5.0" from the top corners of the opening to the center of the top opening. Readjust, as required. Perform a visual inspection to confirm the integrity of the top bearing plate gasket. Change the gasket if it is damaged. After setting the correct gap, torque the bearing plate(s) mounting hardware to 19 ft-lbs.

1.1.5 To adjust the face seal gap(s) at the top center of the opening, loosen the guide track(s) mounting hardware. Loosen all mounting nuts except those at the corner(s) of the door. Pivot the guide track(s) in the inboard/outboard direction to achieve the compressed value. To check the compression of the gasket, use the gauge (plastic or metallic tool) (see picture 4). After the adjustment is made, torque the mounting hardware to 19 ft-lbs.

1.1.6 Manually open and close the doors three times to check the interface between the door center seals (top sensitive edge seals) and the seal transition mounted at the top center of the module frame opening. Verify that the center seals (top sensitive edge seals) do not rub hard against the transition piece during closing. If there is excessive contact between the door seals and the transition piece, readjust the guide track position to minimize this condition. Verify that in the closed position, the seals sit flush against the transition piece. Check for proper roller guide bracket brush seal vertical position. If the brush seal is over compressed, readjust it to obtain a minimum pressure on the brush (the brush must barely touch the door panel top, except for the roller bracket, where the brush compression can be higher).

1.1.7 To adjust the face seal gap(s) at the bottom of the opening, loosen the bottom pivot mounting nut (s), and position the pivot (s), as required, in the inboard/outboard directions. The panels may be closed and lock for ease of adjustment. Tighten the mounting nut(s) and check the gap(s) at the bottom corners of the opening (see picture 5). Re-adjust, as required. Torque the pivot mounting nuts to 38 ft-lbs. after verifying the gap adjustments. Ensure that the previous adjustments are kept (If not repeat all the previous steps).

1.1.8 Manually place the teeter lever in the locked over center position [Door closed and locked]. Check that the bottom seals contact the edge of the threshold at the center of the opening. If there is a gap in this area, loosen the two ¼-20 UNC flat head screws securing the stabilizing wedge to the threshold. Move the wedge inboard until the seals compress against the edge of the threshold. To check the compression of the bottom seals, use the same gauge (plastic or metallic tool) you used to check the top gasket compression (see picture 6). Try to push the gauge (plastic or metallic tool) in between the threshold and the bottom seal. The seal should be compressed enough to feel the resistance but does not bend the gauge (plastic or metallic tool). Do not over compress the

seal. Torque the screws to 5 ft.-lbs. after completing adjustment. Manually open and close each door set and verify that the bottom guide brackets engage the wedge properly without any binding. Verify that the doors close without excessive rubbing of the lower seals on the threshold. If there is excessive rubbing or binding (or both), readjust the wedge position further outboard. Ensure that the previous adjustments are kept (If not repeat all the previous steps).

1.1.9 Before starting this step do steps 4.2.1 to 4.2.8. The threshold brackets have over- sized holes to allow adjustment in the left/right directions for end door and left/right, up/down direction for center doors. The starting position for the door brackets is in their lowest position for the central door panels and in the middle position for the end doors panels. Loosen the four bolts holding the threshold brackets to the door panel and adjust each bracket to the correct position. At the central doors: check that the threshold brackets engage the threshold wedge as the doors close and raise them if necessary to obtain engagement while ensuring that they do not interfere on the threshold. When adjusting these threshold brackets try to obtain an adjustment that will produce engagement of both brackets in the wedge at the same time such that the doors are pulled together in line with each other. Finally, check the plastic end of the threshold brackets are not touching / have some clearance to the bridge-plate cover. The end door threshold brackets are moved longitudinally to obtain simultaneous engagement of the threshold wedge to pull the panels together in line with each other. After the threshold brackets are in place, torque the mounting bolts to 19 ft-lbs. Repeat step 1.1.8.

1.2.0 Door Alignment – Open Position

1.2.1 Manually move each panel set to the open position. Disconnect the connecting rods from the teeter lever and the door shaft levers. To disconnect the connecting rod from the door shaft lever, the panel must be lifted. Take the necessary measures to prevent any scratches, panel damage or other incidents. All the hardware removed during this operation must be replaced with new hardware (Locking devices, washers).

1.2.2 Open each panel set until the bumper on the driver panel makes contact with the driven panel.

1.2.3 In this position, the driver panel should be at approximately 90° to the plane of the door opening. If not, loosen the four bolts securing the roller guide bracket to the door panel. Adjust the roller guide position until the driver panel reaches the 90° position. Verify that the stops are touchin g at this point.

1.2.4 Try to close the doors manually from the full open position (bumpers touching) by turning the door shaft lever with your hand. Some resistance will be encountered prior to the start of motion. Using a clamp, pull or push the panel leading edge with a Force Gauge. The force necessary to move the disconnected panel must be less than 15 lbs. If the panels do not move, adjust

the position of the roller bracket slightly closer to the edge of the leading edge seal and retry closing the doors. This adjustment may cause the driver panel to open more than 90°.

1.2.5 Torque the roller bracket assembly mounting hardware to 19 ft-lbs. after verifying the adjustment.

1.2.6 Place both panel sets in the full open position (bumper stops touching) and verify the clear opening width by measuring between the edges of the sensitive edge seals. The end door clear opening should be 42 inches [1067 mm] minimum and the center door clear opening should be 50 inches [1270 mm] minimum.

1.2.7 Make minor alterations to the clear opening by adjusting the roller bracket guides.

1.2.8 After completing these adjustments, verify that the leading edge of the sensitive edge does not rub against the threshold as the doors open and close. There should be a minimum gap of 0.19 inches [4.8 mm] between the sensitive edge seals and the edge of the threshold when the roller guides are in the straight sections of the guide tracks (see picture 7 and picture 8). Make minor alterations to this gap by adjusting the roller bracket assemblies.

1.3.0 Door Operator Installation/Adjustment (This step is required only if you have to replace the operator) *

1.3.1. With the aide of an assistant, install the door operator assembly on the module frame header extrusion using the fasteners supplied with the door operator assembly. Make sure that the threaded spacers on the top of the base plate are not protruding beyond the top surface of the base plate. If they are protruding, loosen the jam nuts and adjust the spacers to bring them flush or below the surface. Do not torque mounting fasteners at this time.

1.3.2. Raise the door operator as high as possible so that the base plate rests flush against the top of the header extrusion. While holding the door operator in this position, tighten the five fasteners securing the door operator to the vertical wall of the header extrusion. Torque these fasteners to 19 ft-lbs.

1.3.3. Loosen the jam nuts securing the threaded spacers to the base plate assembly. Adjust the spacers until they make contact with the surface of the header extrusion. Finger tighten the spacers and secure their adjustment by tightening the jam nuts.

1.3.4. Insert the ¼ inch mounting bolts through the spacers and header extrusion. Torque the bolts to 9 ft-·lbs.

1.3.5.0 Adjustment and Functional Verification of Door Out-Of-Service (DOOS) Assembly (Adjust only when required – after an accident or during major repair)*

1.3.5.1. Loosen the two nuts and screw securing the DOOS assembly to the base plate and switch plate respectively.

1.3.5.2. With the teeter lever in the fully closed position contacting the nylon bumper, rotate the teeter lever 25° ± 2° towards the opening direction.

1.3.5.3. Adjust the position of the DOOS assembly relative to the teeter lever so that, when actuated, the DOOS lever will engage the plastic roller on the teeter lever assembly.

1.3.5.4. Tighten the two nuts securing the DOOS assembly to the base plate. Tighten the screw securing it to the switch plate.

1.3.5.5. With the teeter lever 30° from the fully closed position, slowly actuate the DOOS lever. Verify that the DOOS1 switch deactivates. Verify that the DOOS lever engages the plastic roller causing the teeter lever to rotate towards the closed direction.

1.3.5.6. Rotate the DOOS lever to the out-of-service position. Verify that the DOOS2 switch is actuated. Verify that the teeter lever contacts the nylon bumper on the base plate in this position.

1.3.5.7. Verify that the DOOS lever remains either in the selected "Normal" or "Out-of-Service" positions.

1.3.5.8. Place the DOOS lever in the "Out-of-Service" position. Actuate the manual release (emergency release) lever. Verify that the DOOS lever springs back to its "Normal" position allowing the teeter lever to rotate.

1.3.6.0 Adjustment of Emergency Switches - EMS1, EMS2, and EMS3 (Adjust only when required – after an accident or during major repair) *

1.3.6.1 Place the manual release handle (emergency handle) in the normal position. Loosen the two nuts securing the switch mounting bracket to the door operator switch plate.

1.3.6.2 Insert a .015 inch thick feeler gage between the switch plungers and the actuating tab on the manual release lever.

1.3.6.3 Push the switches towards the actuating tab until all plungers bottom out against the feeler gage. With the plungers bottomed, tighten the switch bracket mounting nuts to secure adjustment.

1.3.6.4 Remove the feeler gage and apply Glyptal to the mounting screws to complete adjustment.

1.3.7.0 Adjustment of the Over Center Lock Switch

1.3.7.1 Rotate the teeter lever counter clockwise until it stops against the nylon bumper on the base plate.

1.3.7.2 Loosen the two nuts securing the over center switch mounting bracket to the door operator switch plate.

1.3.7.3 Insert a 0.150 inch feeler gage between the over center lock switch lever and the nylon cam (see picture 9).

1.3.7.4 Slide the over center switch and mounting bracket along the slot on the switch plate until the switch bottoms against the nylon cam. Make sure the teeter lever is bottoming against the feeler gage on the bumper.

1.3.7.5 Torque the switch bracket mounting nuts (17 in-lbs) to secure adjustment.

1.3.7.6 Remove the feeler gage and apply Glyptal to the switch mounting screws to complete adjustment.

1.3.8.0 Manual Release Functional Verification *

1.3.8.1 Rotate the teeter lever to the fully closed position and verify that it is making contact with the nylon bumper stop.

1.3.8.2 Place the Manual Release Lever in the "Normal" position. Verify that the Manual Release Lever is actuating switches EMS1, EMS2 and EMS3.

1.3.8.3 Slowly begin to actuate the Manual Release Lever. Verify that switches EMS1 and EMS2 deactivate before the lever contacts the spiral pin on the teeter lever output shaft.

1.3.8.4 Verify that the Manual Release Lever rotates the teeter lever in the open direction at least 30°.

1.3.8.5 Verify that the Manual Release Lever remains in the toggled position in both "Normal " and "Emergency" positions.

1.4.0 Door Linkage Adjustment

1.4.1 After completing door panel alignment, attach the RH and LH connecting rods to the respective door operator teeter lever pins. Apply cotter pins through the hole of each pin and after torqued (22 ft-lbs) the lock nuts.

1.4.2 Place the teeter lever in the locked, over center position. The teeter lever must contact the plastic bumper on the base plate assembly.

1.4.3 Loosen the jam nuts securing the rod end bearings to the connecting rod. Rotate the connecting rod so that the panel begins to close against the module frame.

1.4.4 Adjust the connecting rod length so that the doors compress the face seal. Check that the door bottom seals are contacting the edge of the threshold. Do not over compress the seals.

1.4.5 Verify the contact between the door and face seal and between the bottom door seals and the edge of the threshold by inserting a 0.015-inch thick special gauge (plastic or metallic tool) along these areas (see picture 10).

1.4.6 Repeat the above steps for the opposite door.

1.4.7 Using a force gage, measure the force required to actuate the manual release lever on the door operator assembly. This force should not exceed 50 pounds (see picture 11). If the force exceeds 50 pounds, then readjust the connecting rods to reduce the amount of pre-load between the doors and the face seal and check the force again. Recheck the doors / face seal interface as described in step 1.4.5.

1.4.8 Using a force gage, measure the force required activating the lower manual release
Lever (at the center door locations only). Pull the lever with the gage while maintaining a 90° angle between the gage and the ma nual release lever. The force measured once the doors open should not exceed 60 pounds (see picture 12). If the force exceeds 60 pounds readjust the connecting rod lengths as described in step 1.4.7 and/or check the routing of the manual release cable for snags or kinks. Also verify that the manual release lever rotates freely without any interference with the adjacent structure.

1.4.9 Using a clamp, measure the force needed to pull and push the panel leading edge with a Force Gauge. The force necessary to move the connected panels must be less than 20 lbs.

1.4.10 Tighten all connecting rod jam nuts after verifying adjustment. Before tightening check for proper spherical bearing alignment (The spherical bearings must be along the same line).

1.4.11 Manually open the door panels. Verify that the door bumper stops touch in the full openposition. With the bumper stops touching, verify that the DOOS pin on the door operator teeter lever is not touching the plastic stop on the motor and gear housing assembly. If the DOOS pin touches the plastic stop readjust the position of the driven panels until the DOOS pin looses the contact with the plastic stop. After this readjustment is completed, then verify that you have a minimum of 50” for the central door opening or 42” for the end door opening.

1.4.12 Verify clear door opening as described in step 1.2.6.

1.5.0 Door Panel Sensor Adjustment

1.5.1 Place the doors in the fully closed and locked position.

1.5.2 Place a 0.060” to 0.100” shim on the top surface of the roller bracket assembly directly beneath the sensing face of the panel sensor.

1.5.3 Loosen the panel sensor bracket mounting hardware and lower the sensor assembly until the sensor face makes contact with the shim.

1.5.4 Torque the sensor bracket mounting hardware to 19” inch pounds and secure adjustment.

1.5.5 Remove the shim and verify the gap using a feeler gage. As an example using a 0.09 inch shim, a 0.08-inch feeler gage should be GO and a 0.1-inch feeler gage NO GO.

2.0 DOOR SYSTEM TEST PROCEDURES

2.1.0 Instrumentation

The following items will be required to functionally test each door module assembly:

- Test box with variable power supply
- Test fixture to support door module assembly
- Flat solid bar measuring 0.38 inch [9.5 mm] thick and 3 inches [76 mm] wide
- A 0.75 inch [19 mm] diameter solid rod
- P.T.U. (Portable Test Unit)

2.2.0 Pretest Preparation (follow this step only if the train is without power)

2.2.1 Attach the module assembly and the stabilizing fixture to the test stand.

2.2.2 Connect the test box to the door control module. Set power supply voltage to 37.5 volts.

2.2.3 Manually open and close the doors. Verify that the doors move freely without any binding or interference with test fixture.

2.3.0 Door Open and Close Speed Check *

2.3.1 Place doors in the fully closed and locked position.

2.3.2 Command the doors to open and measure the time.

2.3.3 The time required for the doors to reach their full open position shall be 2.5 ±0.2 seconds.

2.3.4 With the doors in the full open position, command the doors to close and measure the time.

2.3.5 The time required for the doors to reach their fully closed position shall be 3.0 ±0.2 seconds.

2.3.6 Set the variable power supply voltage to 24 VDC and repeat steps 2.3.1 through 2.3.5.

2.4.0 Obstruction Detection Test

2.4.1 Open the doors.

2.4.2 Command the doors to close. As the doors begin to close insert the 3 X 3/8 inch [76 x 9.5 mm] test specimen (so that the 3 " face of the flat bar test specimen meets the door panel edge) along the line where the door panel edges mesh. Insert the test specimen anywhere along the length of the edges except for the upper most 3 inches [76-mm] and lower most 1 inch [25-mm] of the door panel edge. Repeat this three times at locations near the top, middle and bottom.

2.4.3 The doors should recycle open after encountering the obstruction.

2.4.4 Repeat steps 2.4.1 thru 2.4.3 using the 0.75 inch [19 mm] diameter test specimen.

2.4.5 Check for proper sensitivity of the sensitive edge (Left and Right). To obtain the proper obstruction detection turn left or right the pressure wave switch knob (see picture 18). Adjust the pressure wave switch knob until the proper sensitivity is achieved (i.e.: previous steps are passed). With the door panels open, push the close button and apply a small amount of pressure on the sensitive edge of each door panel or use the gage block described in the previous steps to ensure that the pressure wave switch of each door leaf functions as intended.

To adjust the pressure wave switch:

1) If it is too sensitive, (the door recycles without an obstruction) you will have to decrease the sensitivity of the pressure wave switch by turning clockwise with a screwdriver for approximately one-quarter turn.

2) If it is not sensitive enough, (the pressure wave switch does not detect one of the specified obstacles) you will have to increase the sensitivity of the pressure wave switch by turning counter clockwise with a screwdriver for approximately one-quarter turn.

If necessary repeat steps 2.4.1 thru 2.4.5.

2.4.6 Measure the force applied by the doors on an obstruction with the sensitive edges functioning (normal condition). To do this, first command the doors to open. Place a force gage (approximately 9" to 10" in overall length) at the center of the opening. The shaft end of the force gage should have a 1" x 1" [25 x 25 mm] block attached to it. Command the doors to close against the force gage. One door will strike the square block and the other will strike the opposite end of the force gage. Position the force gage so that the doors strike the gage simultaneously.

2.4.7 The maximum force measured should not exceed 35 pounds in normal condition.

3.0 BRIDGEPLATE ADJUSTMENT PROCEDURE

3.1.0 Ramp Alignment (Adjust only when required – after an accident or during major repair) *

3.1.1 Place the bridge plate in the partially deployed position. Loosen the roller guides located near the edge of the ramp. Rotate the roller guide eccentric pins until there is a maximum gap between the rollers and the side rails of the ramp.

3.1.2 Place a 1" [25 mm] spacer between the rear tube of the frame and each carriage plate.

3.1.3 Manually rotate one of the screws to slowly bring the bridge plate into the stowed position.

3.1.4 Verify that support ramp carriage plates simultaneously make contact with the spacers. If not, loosen the tensioner for the outer belt and remove belt. Rotate the screw as required to properly align the ramp assembly making sure that both spacers are making contact with the carriage plates.

3.1.5 Carefully reinstall the belt and tensioner and verify adjustment.

3.1.6 With the ramp in the partially deployed position, place a 0.032” [0.8 mm] feeler gage between the side rail of the ramp and the roller guide. Turn the roller guide eccentric pin until the roller makes contact with the feeler gage. Tighten the guide roller mounting hardware to secure adjustment. Repeat adjustment for the roller on the opposite side.

3.1.7 Manually rotate the drive screws to slowly bring the ramp into the fully stowed position. Verify that the lock pins simultaneously engage the sidetracks. If the pins do not engage at approximately the same time (within 0.06 " [1.5 mm] of movement), verify ramp alignment as described in steps 3.1.1 through 3.1.6.

3.1.8 Measure the bridge plate obstruction force. Close and open the bridge plate using the crew-key switch. Measure the bridge plate force along the same plane as the bridge plate movement and exactly opposite to it. The measured force must be less than 45 lbs. If the obstruction force is higher use the PTU (Portable Test Unit) to make minor incremental adjustments.

3.2.0 Belt Tension Adjustment

3.2.1 Place the bridge plate in the stowed position.

3.2.2 Insert force gage push rod in the rear tube through the slot under the bridge plate motor.

3.2.3 Place the gage push rod as far from the motor shaft as possible. Push the bottom section of the belt towards the top section of the belt until both sections touch each other. The force applied should be 20 to 35 lbs (see picture 13).

3.2.4 If adjustment is required, loosen belt tensioner roller nuts and adjust accordingly. Check belt tension again to verify adjustment.

3.2.5 Tighten tensioner nuts to secure adjustment.

3.2.6 Repeat procedure for remaining belt.

3.3.0 Solenoid and Bracket Assembly Adjustment

3.3.1 Place bridge plate in stowed position.

3.3.2 Check that the lock pins are engaged with the sidetracks.

3.3.3 Loosen the screws securing the solenoid and bracket assemblies to the carriage plates.

3.3.4 Adjust the orientation of each solenoid so that it is in line with the lock link (centerline of the link and solenoid should be approximately in line). Check for all hardware and “C”-clips presence.

3.3.5 Tighten the solenoid bracket mounting hardware.

3.4.0 Lock Switch Adjustment

3.4.1 Place bridge plate in the stowed position.

3.4.2 Check that the lock pins are engaging the sidetracks.

3.4.3 Loosen the screws securing the switch mounting brackets to the support plates.

3.4.4 Insert a 0.062” [1.5 mm] thick feeler gage between the switch lever and lock lever at the point of contact (see picture 14).

3.4.5 Slide the switch and bracket assembly towards the lock lever until the switch lever bottoms against the feeler gage and the switch is fully actuated.

3.4.6 Tighten the two screws securing the switch and bracket assembly to the support plate.

3.4.7 Manually actuate the lock lever and verify that the linkage clears the switch. Verify proper switch actuation (0.062” [1.6 mm])

3.4.8 Apply Glyptal to the switch bracket mounting hardware to complete adjustment.

3.4.9 Repeat steps 3.4.3 through 3.4.8 for the switch on the opposite side.

3.5.0 Manual Release and Stow Verification

3.5.1 Place ramp in the fully deployed position. Verify that locks engage with sidetracks.

3.5.2 Cut-out motor circuit. Actuate manual release lever on each side of assembly. Push down on ramp slightly to prevent locking pins from re-engaging with the sidetrack.

3.5.3 Manually push the ramp into the stowed and lock position. Measure the force required tomanually push the ramp with a force gage once the ramp is placed in a horizontal position. This force should not exceed 45 lbs.

4.0 BRIDGEPLATE CAR INSTALLATION AND ADJUSTMENT PROCEDURE

4.1.0 Installation *

4.1.1 When uncrating the bridge plate, make sure to lift at all four corners of the frame using an overhead hoist. Install the bridge plate on the car as described below. Access for installation is from the side or from underneath the car.

4.1.2 Place two 60-inch supports such as 2” x 4” lumber on the lift platform of a wheeled hydraulic lift. With assistance, place the bridge plate on the lift so the bridge plate is supported on the side tubes. The rear tube must lead as the assembly is placed into the car.

4.1.3 Carefully raise the platform until the bridge plate will just clear the mounting rails. Using the wheeled hoist, guide the bridge plate into the car opening onto the mounting rails. Slide the bridge plate into place.

4.1.4 Position the bridge plate so that the mounting screw slots on the car mounting flanges and the screw holes in the bridge plate mounting flanges are aligned.

4.1.5 Apply shims between car structure and bridge plate frame as required to eliminate gaps.

4.1.6 Install 7 screws, three in each side flange, and one in the rear flange. Do not tighten the screws at this time.

4.1.7 Remove the button head screws and lock washers securing the back section of the hinged bottom cover. Swing the bottom cover down.

4.1.8 Join the car wiring harness at the bridge plate connector and make sure the connector is secured to the tie mount with a harness tie.

4.1.9 Slide the fitting bracket into the wiring cutout in the side tube, and position and tighten the liquid tight cable connector (see picture 15).

4.1.10 Restore electrical power to the door system.

4.1.11 Ensure that a platform is present (can be replaced by a support with a convenient height, 7" to 8" above TOR (Top of the Rail), placed at a proper distance). Deploy and retract the bridge plate several times to verify smooth operation. Timing for the Bridge plate movement from a fully stowed position to a fully deployed position or from a fully deployed position to a fully stowed position is 9.5 +/- 0.5 seconds.

4.2.0 Adjustment

4.2.1 Verify and tighten all the mounting hardware on the bridge plate elements: solenoid mounting screws, solenoid brackets mounting screws, lever switch mounting screws, link pins, retaining rings ("C" Clips), etc.

4.2.2 Command the ramp to deploy (Platform not required)

4.2.3 With the ramp fully deployed, raise the ramp until the back edge of the ramp makes contact with the outside edge of the threshold. In this position, the ramp should be in a horizontal position and square to the body of the car.

4.2.4 If the ramp is not horizontal, slide the bridge plate frame outward, away from the centerline of the vehicle, until the deployed ramp can assume a horizontal position.

4.2.5 If the deployed ramp can be lifted up past horizontal position, slide the bridge plate frame inward, towards the centerline of the vehicle, until the deployed ramp can be manually lifted only up to a horizontal position.

4.2.6 With the deployed ramp lifted up to a horizontal position and with the back edge of the ramp touching the outside nose of the threshold, verify that the back edge of the ramp is contacting the threshold nose along its entire width. Adjust the angular position of the bridge plate assembly with respect to the car as required to eliminate gaps.

4.2.7 Leave the fully deployed ramp to rest on its own weight. Measure the gap between the back edge of the ramp and the edge of the threshold. The gap at the left corner, at the middle and at the right corner should be the same = 1" + 1/16" , - 1/8" (The target value for adjustment is 7/8", see picture 16).

4.2.8 Upon completing adjustments, torque the bridge plate mounting hardware to the car builder's recommended torque values.

4.2.9 Turn the bridge plate motor OFF and with the ramp in the deployed position clean the roller channels using clean rag and chemical solvent.

4.2.10 Check and if needed, apply proper grease on the ball screws. Apply a generous coating of grease, lithium base, Vapor p/n: 67110044-03 to screw threads prior to assembly.

4.2.11 Actuate the manual unlock levers to release the ramp.

4.2.12 Manually place the ramp in a horizontal position. Measure the force required to manually stow the ramp using a force gage. The force required to manually stow the ramp should not exceed 45 lbs.

4.2.13 Using the force gauge check the belt tension as shown in step 3.2.2 and 3.2.3. If adjustment is required, follow steps 3.2.4 and 3.2.5.

4.2.14 Using a feeler gauge check the proper gap on the lever switches. Insert a 0.062" thick feeler gage between the switch lever and lock lever at the point of the contact. If adjustment is required, follow steps 3.4.4, 3.4.5, 3.4.6 from the procedure.

4.2.15 Using a feeler gage check the proper gap on the proximity switch. Recommended gap is 0.06" to 0.100". As example, if the target value for gap adjustment is 0.090", insert a 0.090" thick feeler gauge between the proximity switch and the target (see picture 17), if the 0.090" feeler gauge is introduced the gap is at least 0.090". By increasing the feeler gauge thickness with 0.002" increments actual gap value can be determined. If adjustment is required, turn the screw (see picture 21) clockwise (CW) to increase the gap or counter-clockwise (CCW) to reduce the gap.

4.2.16 Turn ON the bridge plate power. Deploy and retract several times to verify smooth operation. Ensure that a platform is present; 7" to 8" above top of the rail (can be replaced by a support with a convenient height, placed at a proper distance).

4-2.17 Swing the bottom cover section into position and install the button head screws. Torque the screws to 25 ± 1 inch/lbs.

4.3.0 On-Car Testing

4.3.1 Retract, and deploy several times to verify smooth operation. Ensure that a platform is present (can be replaced by a support with a convenient height, 7 to 8 inches above top of the rail, placed at a proper distance).

4.3.2 Command the bridge plate to fully deploy. Turn OFF the bridge plate motor power and interlock switches located on the door operator assembly.

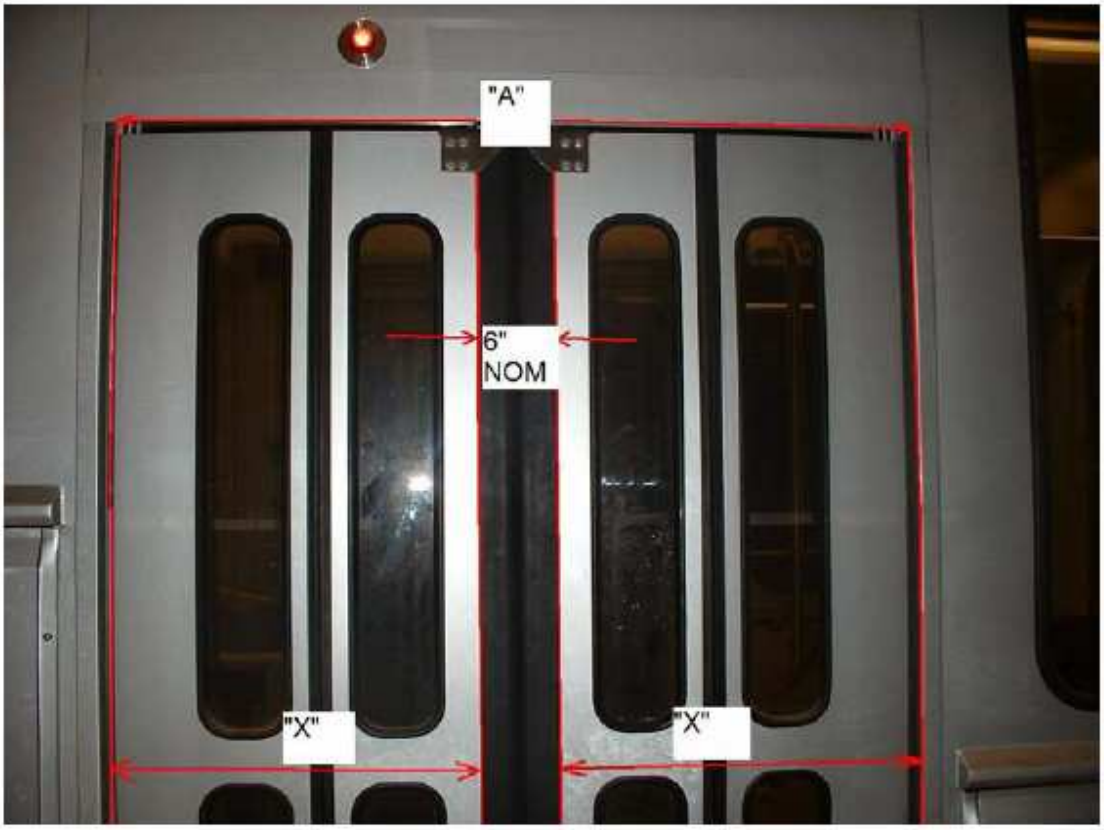
4.3.3 Actuate the manual unlock levers to release the ramp.

4.3.4 Manually place the ramp in a horizontal position. Measure the force required to manually stow the ramp using a force gage. The force required to manually stow the ramp should not exceed 45 lbs.

4.3.5 Reset the bridge plate motor and interlock bypass switches to the ON position.

5.0 ANNEX

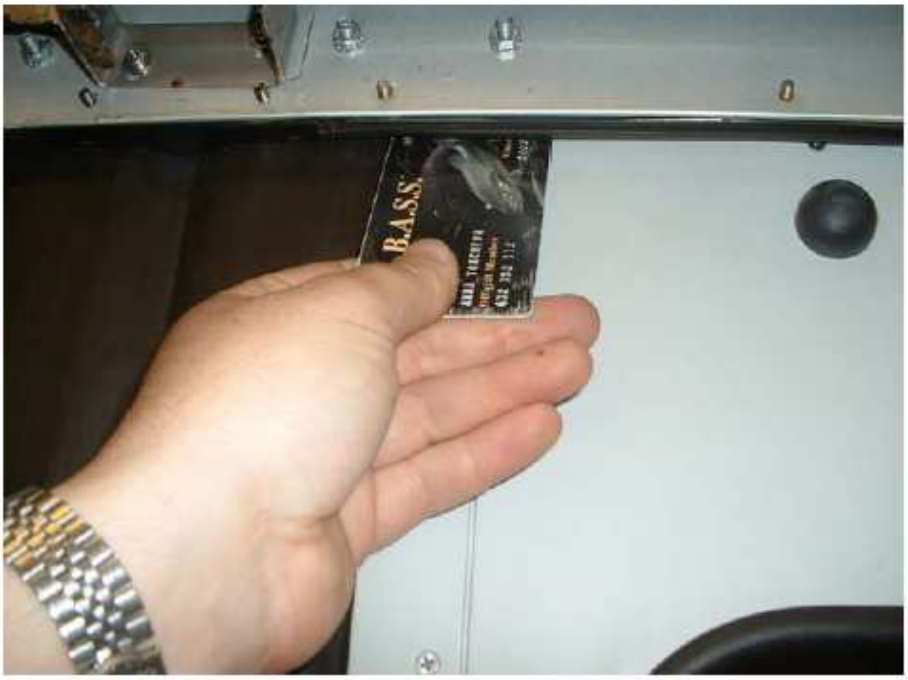
Pictures



Picture 1, paragraph 1.1.2

Picture 2, paragraph 1.1.2

Picture 3, paragraph 1.1.4

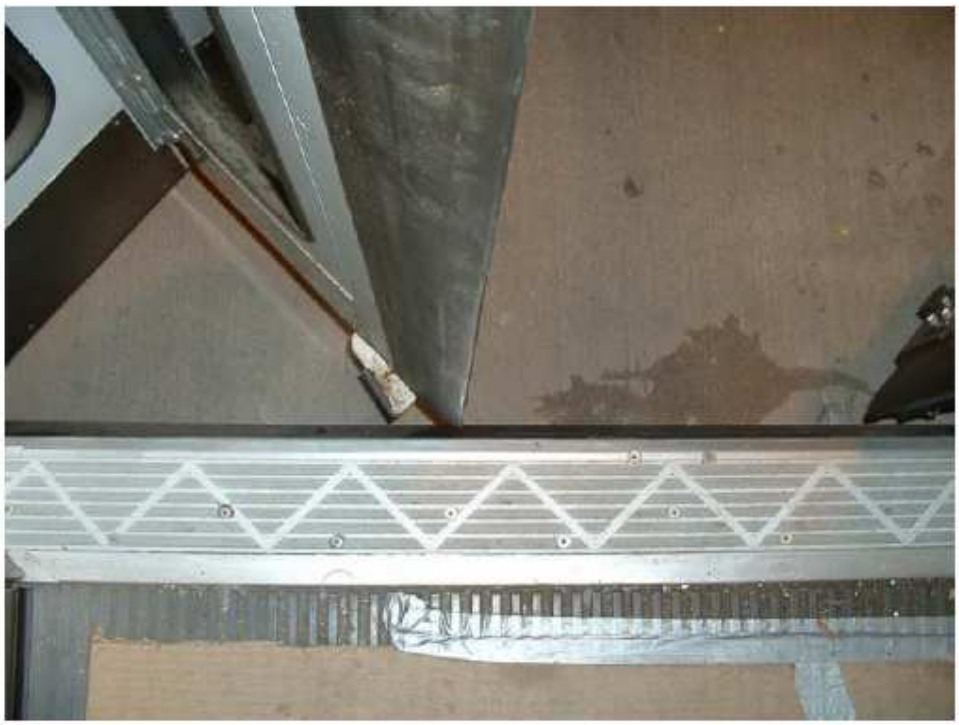


Picture 4, paragraph 1.1.5

Picture 5, paragraph 1.1.7

Picture 6, paragraph 1.1.8

Picture 7, paragraph 1.2.8



Picture 8, paragraph 1.2.8

Picture 9, paragraph 1.3.7.3

Picture 10, paragraph 1.4.5

Picture 11, paragraph 1.4.7

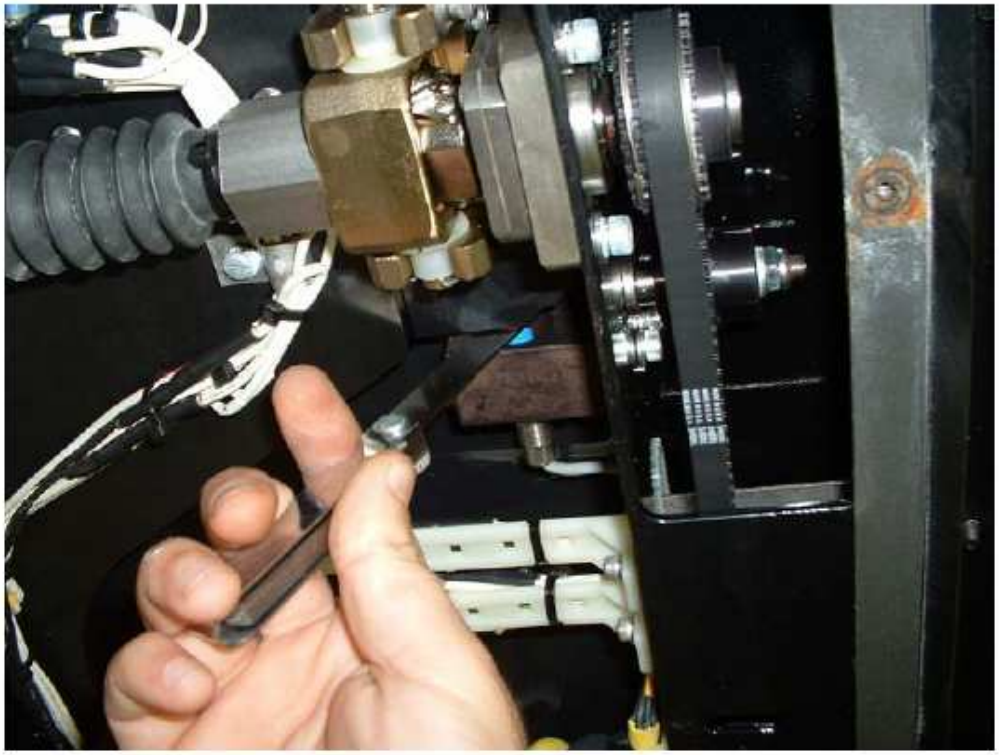
Picture 12, paragraph 1.4.8

Picture 13, paragraph 3.2.3

Picture 14, paragraph 3.4.4

Picture 15, paragraph 4.1.9

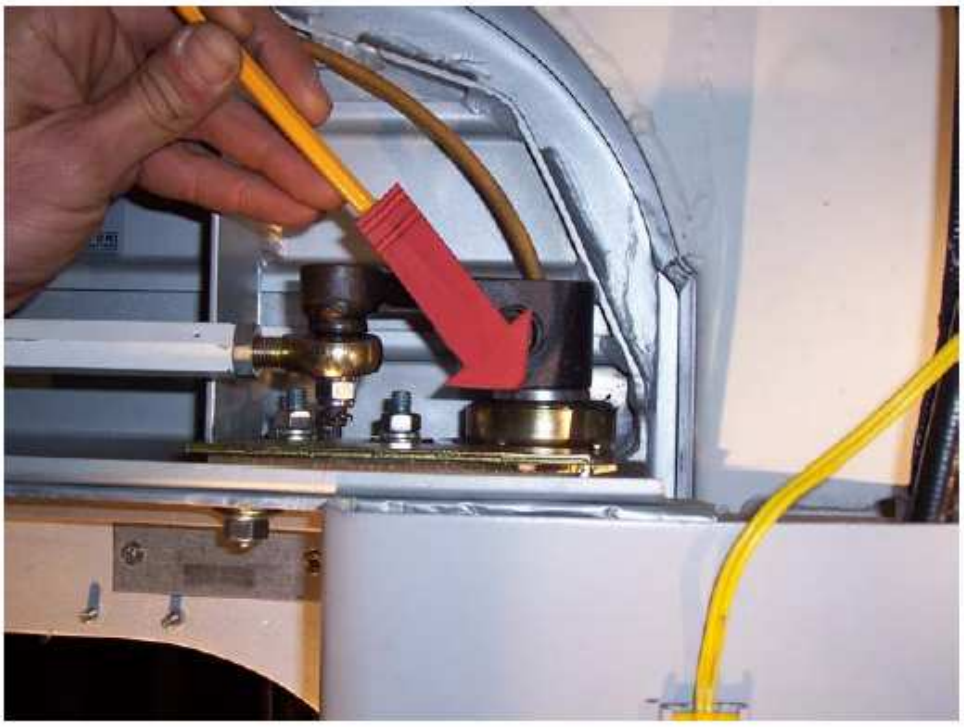
Picture 16, paragraph 4.2.7



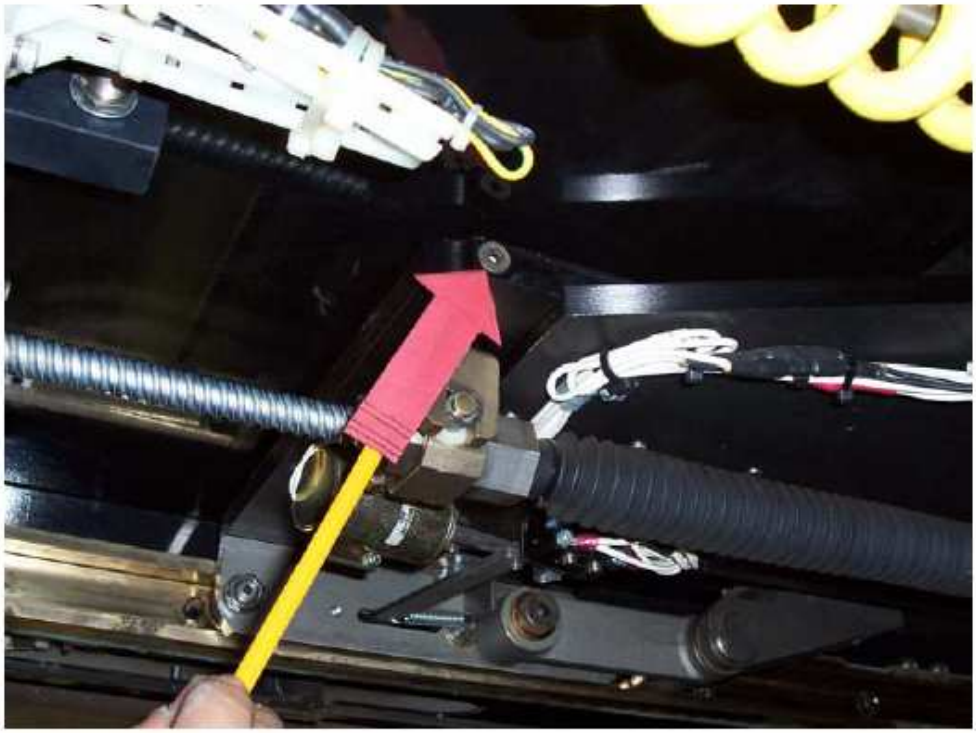
Picture 17, paragraph 4.2.15

Picture 18, paragraph 2.4.5

Picture 19, paragraph 1.1.1



Picture 20, paragraph 1.1.1



Picture 21, paragraph 4.2.15

5.2 Figures

Table1, Checklist MBTA # 8

DOOR AND BRIDGEPLATE ADJUSTMENT AND TEST PROCEDURE

Car #_____ Door #_____		Date____/____/____/			Initials_____
Step	Operation	Dimensions / Tools	Yes	No	Comments
1.1.2	Verify and adjust the distance in the forward / aft direction between the leading edge of the each panel set and the vertical members of the module frame. The door is in closed and locked position.				
1.1.3	Measure the distance at the top, center and bottom of the opening between the door panel sealing edges. The door is in close and lock position.	6" ± .06"			
1.1.4	Verify and adjust upper corner seal contact between the inside surface of the door panels and the seal. Measure up to 5" from the corner. The door is in close and lock position.	0.015"			
1.1.5	Verify and adjust the face seal gap at the top center of the opening. The door is in close and lock position.	0.015"			
1.1.6	Verify that the center seals do not rub hard against the transition piece during closing. Check for proper brush seal vertical position. Readjust if needed.				
1.1.7	Check the seal gap(s) at the bottom corners of the openings. Readjust if needed. The door is in close and lock position.	0.015"			
1.1.8	Check the seal gap at the bottom center of the opening. Readjust if needed. The door is in close and lock position. Verify that the door close without excessive rubbing of the lower seals on the threshold.	0.015"			
1.1.9	Verify that the end door threshold brackets are in center position and the center door threshold brackets are in their lowest position. Readjust if required.				
1.2.3	With the door in full open position (the bumper of the driver panel in contact with the bumper of the driven panel) verify the position of the driver panel to the plane of the door opening. Readjust if required.	Approx. 90°			
1.2.4	Force to close / open the door (without tie-rods). Door to be pulled / pushed from the door leading edge.	Max. 15 lbs.			

1.2.6	With the door in full open position (bumper stops touching) the clear opening.	end door min. 42" center door min. 50"			
1.2.8	Verify the minimum gap between the leading edge seals and the threshold. Readjust if required.	0.19"			
1.3.6.2*	Adjustment of emergency switches, EMS 1, EMS 2 and EMS 3*	0.015" gage			
1.3.7.3	Check the gap between the over center lock switch Lever and the nylon cam. The door is in close and lock position.	0.150"			
1.3.8.4*	Verify Manual Release Lever rotations teeter lever in the open direction*	At least 30°			
1.4.5	Verify contact between the door and face seal and between the bottom door seals and edge of threshold Readjust if required. The door is closed and locked.	0.015"			
1.4.7	Measure the force required to actuate the manual release lever on the door operator assembly. Readjust if required.	Max. 50 lbs.			
1.4.8	Measure the force required activating the lower manual release lever (at the center door locations only)	Max. 60 lbs.			
1.4.9	Force to close / open the door (with tie-rods connected). Door to be pulled / pushed from the door leading edge.	Max. 20 lbs.			
1.5.5	Check the gap between the top surface of the roller bracket assembly and the proximity sensor.	0.06" – 0.1"			
2.3.3*	Verify time from full closed position to reach full open position*	2.5 ± 0.2 seconds			
2.3.5*	Verify time from full open position to reach full closed position*	3.0 ± 0.2 seconds			
2.4.2	Insert 3"x3/8" specimen, 3" side parallel to rubber nose between edge rubber mesh. Repeat three times at locations 3" below top, near middle and 1" above bottom. Doors should open when encountering obstacle.	3/8"			
2.4.4	Insert 0.75" diameter specimen, perpendicular to the door side and between the door opening edge rubber mesh. Repeat three times at locations 3" below top, near middle and 1" above bottom. Doors should open when encountering obstacle.	.75"			

2.4.5	Measure the force applied by the doors on an obstruction with sensitive edges functioning.	Max. 35 lbs			
3.1.8*	Verify the bridge plate obstruction force*.	Max. 45 lbs.			
3.2.3	Measure the bridge plate belts tension. Readjust if required.	20 lbs. to 35 lbs.			
3.3.4	Verify the bridge plate solenoid orientation. Center of the link and the solenoid should be approximately in line. Readjust if required.				
3.4.4	Verify the gap between the bridge plate switch lever and the lock lever at the point of contact.	0.062"			
3.5.4	Measure the force required to manually push the ramp. The ramp is in a horizontal position.	Max. 45 lbs.			
4.1.11*	Verify time duration of bridge-plate movement from fully stowed position to fully deployed position*.	9.5 ± 0.5 seconds			
4.1.11*	Verify time duration of bridge-plate movement from fully deployed position to fully stowed position*.	9.5 ± 0.5 seconds			
4.2.1	Verify all the mounting hardware on the bridge plate Components.				
4.2.3	Verify that the bridge plate is squared to the body of the car.				
4.2.7	Measure the gap between the back edge of the ramp and the edge of the threshold.	1" +1/16", -1/8"			
4.2.9	Clean the bridge plate roller channels. The bridge plate is in deployed position.				
4.2.10	Check and if needed apply proper grease on the ball screws.				
4.2.15	Verify the gap between the bridge plate proximity switch and its target.	0.06" – 0.1"			

4.2.17	Close the bottom bridge plate cover and torque the screws.	25 ± 1 in/lbs			
4.3.1	Deploy and retract ramp several times to verify smooth operation.				

Table 2, Table of Standard Torque Values

NOTES :

1. The torque values in the table below are valid for fine and coarse threads, and for non lubricated fasteners.

2. All steel fasteners are plated (cadmium, zinc or zinc phosphate), or in the case of a nut-bolt arrangement, at least one of the two components is plated. For non plated steel fasteners, multiply the torque figures by the factor 1.1.

3. Fasteners must be free from oxidation or rust.

4. If the fastener is lubricated, multiply the torque figures by the factor 0.9.

5. If a self-locking fastener is used, the specified torque value is calculated as follows: Torque value in chart plus torque required to turn the fastener before the fastener starts to compress the components to be assembled.
   As an example, the torque required to turn metric Esna nuts (with nylon patch) is as follows:

M3	1 in-lbs	M4	2 in-lbs	M5	4 in-lbs
M6	4 in-lbs	M8	9 in-lbs	M10	15 in-lbs

6. Nuts must be, as a minimum, of standard height and material grade equal to or exceeding the bolt or stud used.

7. Length of engagement into tapped holes must be at least equivalent to the height for standard nuts when the strength of the tapped material matches the minimum strength of the fastener. When the strength of the tapped material is lower than the strength of the fastener (i.e. such as aluminum for tapped material and steel for fastener), the length of thread engagement in the tapped hole must be approximately 2 times the nominal fastener diameter.

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8. The fasteners should be torqued with calibrated torquing instruments set at the values specified below. The acceptable tolerance is ± 10%.

9. No distinction is made between bolts, screws and studs for this table.

10. Torque could be applied to either the nut or the screw.

11. In a nut-bolt arrangement, the torque specified for the weakest fastener is prevailing.

12. The component being compressed by the fastener must be of sufficient strength not to deform under the specified torque unless otherwise specified.

13. To convert ft-lbs to N-m, multiply by 1.356. To convert in-lbs to N-m, multiply by 0.113. To convert in-lbs to N-cm, multiply by 11.3 .

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Bolt size	Screws steel Grade 2 (see note A)	Cap screws steel grade 5 (see note B)	Yellow brass screw (see note C)	St. St. screws (see note D)	Aluminum screws (see note E)	Nylon (Zytel 101) screws & nuts (note F)
#2	2.1 in-lbs		1.7 in-lbs	2.3 in-lbs	1.3 in-lbs	
#3	3.0 in-lbs		2.7 in-lbs	3.6 in-lbs	1.9 in-lbs	
#4	4.9 in-lbs		3.7 in-lbs	5.0 in-lbs	2.6 in-lbs	
#5	6.5 in-lbs		5.4 in-lbs	7.2 in-lbs	3.8 in-lbs	
#6	8.9 in-lbs		6.8 in-lbs	9 in-lbs	4.8 in-lbs	0.96 in-lbs
#8	16 in-lbs		14 in-lbs	19 in-lbs	10 in-lbs	1.9 in-lbs
#10	26 in-lbs		16 in-lbs	22 in-lbs	12.6 in-lbs	3.7 in-lbs
¼	61 in-lbs	87 in-lbs	53 in-lbs	71 in-lbs	41 in lbs	10.3 in-lbs
5/16	114 in-lbs	14.6 ft-lbs	91 in-lbs	124 in-lbs	72 in-lbs	18 in-lbs
3/8	17 ft-lbs	25 ft-lbs	14 ft-lbs	19 ft-lbs	10.8 ft-lbs	24 in-lbs
7/16	27 ft-lbs	41 ft-lbs	22 ft-lbs	30 ft-lbs	17 ft-lbs	32 in-lbs
½	41 ft-lbs	61 ft-lbs	30 ft-lbs	41 ft-lbs	23 ft-lbs	37 in-lbs
9/16	59 ft-lbs	89 ft-lbs	40 ft-lbs	53 ft-lbs	31 ft-lbs	52 in-lbs
5/8	84 ft-lbs	122 ft-lbs	65 ft-lbs	87 ft-lbs	54 ft-lbs	

NOTE:

A Plated steel machining screws non-heat treated, plated steel cap screws grade S.A.E. 2, steel plated nuts grade S.A.E. 2 (tens. Str.: min. 65,000 PSI).

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B Plated steel cap screws or nuts grade S.A.E. 5 (tens. Str.: min. 116.000 PSI).

C Yellow brass cap screws or machine screws (tens. Str.: min. 60.000 PSI).

D Stainless steel machine screws, cap screws and nuts in series 300. (tens. Str.: min 80.000 PSI).

E Aluminum 2024-T4 (or equivalent in strength) fasteners (tens. Str.: min.55.000 PSI).

F Nylon fasteners. These values were converted from metric fasteners made from Polyamid 6.6 (nylon 6.6). Could be a bit too conservative.

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Bolt size	Plated steel Shallow Socket screws grade 8.8 (see note G)	Plated steel Fasteners Grade 4.8 (see note L)	St. St. Shallow Socket Screws (see note H)	Plated Steel Fasteners Grade 8.8 (see note I)	St. St. Fasteners A2/A4 (see note J)	Brass Fasteners (see note K)	Polyamid 6.6 (nylon 6.6) screws & nuts	St. St. Esna Nut No grade Spec.
M 2		1.1 in-lbs			2.2 in-lbs	1.0 in-lbs		
M 2.5		2.3 in-lbs			4.4 in-lbs	2.1 in-lbs		
M 3	7.3 in-lbs	4.1 in-lbs	4.0 in-lbs		8.1 in-lbs	3.7 in-lbs	0.7 in-lbs	6 in-lbs
M 4	15 in-lbs	9.4 in-lbs	8.1 in-lbs		19 in-lbs	8.8 in-lbs	1.8 in-lbs	14 in-lbs
M 5	37 in-lbs	18.4 in-lbs	17 in-lbs		38 in-lbs	16 in-lbs	4.0 in-lbs	28 in-lbs
M 6	66 in-lbs	32 in-lbs	33 in-lbs	7.4 ft-lbs	65 in-lbs	29 in-lbs	9.2 in-lbs	48 in-lbs
M 8	11 ft-lbs	77 in-lbs	51 in-lbs	15 ft-lbs	13 ft-lbs	66 in-lbs	18 in-lbs	9 ft-lbs
M 10	23 ft-lbs	12.9 ft-lbs	11.4 ft-lbs	30 ft-lbs	27 ft-lbs	10.4 ft-lbs	26 in-lbs	20 ft-lbs
M 12	40 ft-lbs	22 ft-lbs	19 ft-lbs	54 ft-lbs	45 ft-lbs		33 in-lbs	33 ft-lbs
M 14	64 ft-lbs	36 ft-lbs		86 ft-lbs	73 ft-lbs		50 in-lbs	54 ft-lbs
M 16	100 ft-lbs	54 ft-lbs	37 ft-lbs	129 ft-lbs	112 ft-lbs		61 in-lbs	
M 18		74 ft-lbs		187 ft-lbs	159 ft-lbs			
M 20		105 ft-lbs		260 ft-lbs	226 ft-lbs			
M 22		141 ft-lbs		349 ft-lbs				
M 24		181 ft-lbs		441 ft-lbs				
M 27								
M 30								

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NOTE:

G Specifically for plated steel socket shoulder screws & socket screws with shallow or small sockets DIN 6912 grade 8.8, ISO 7379 grade 12.9, DIN 7991 grade 10.9, ISO 7380 grade 10.9. For DIN 7984 grade 8.8, multiply the torque values by 0.8. For BN 1206, multiply the torque values by 0.55 (tens. str.: min. 116,000 PSI).

H Specifically for stainless steel socket shoulder screws & socket screws with shallow or small sockets A2/A4 class 70, DIN 7984, DIN 7991, ISO 7380. For DIN 6912, multiply the torque values by 1.3 (tens. str.: min 101,000 PSI).

I General specifications for plated steel bolts (grade 8.8), screws (grade 8.8) or nuts (grade 8) (tens. str.: min 116,000 PSI). For plated steel bolts (grade 10.9), screws (grade 10.9) or nuts (grade 10), multiply the torque values by 1.39.

J General specifications for stainless steel fasteners A2/A4 class 70 (tens. str.: min 101,000 PSI). For stainless steel fasteners A2/A4 class 80, multiply the torque values by 1.33. For stainless steel fasteners A2/A4 class 50, multiply the torque values by 0.47.

K General specifications for brass fasteners, electroplated or not. (tens. str.: min 55,000 PSI).

L General specifications for plated steel bolts (grade 4.8, 5.6), screws (grade 4.8, 5.6) or nuts (grade 5 if $\leq$ M16, grade 4 if > M16. For plated steel bolts or screws grade 4.6, multiply the torque values by 0.79. For plated steel bolts or screws grade 5.8, multiply the torque values by 1.29.

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5.3 Vapor recommended steps to follow during scheduled maintenance.

Appendix information was compiled by completion of the ten car Pilot Program. This appendix outlines the sequence of steps to be taken during a scheduled maintenance program.

Bridge Plate

Section
3.3.0 thru **3.3.5** Solenoid and Bracket Assembly Adjustment.

Section
3.4.0 thru **3.4.9** Lock switches Adjustment.

Section
3.2.0 thru **3.2.6** Belt Tension Adjustment.

Section
4.2.0 thru **4.2.17** Adjustment.

Section
4.3.0 thru **4.3.5** On Car Testing.

Section
3.5.0 thru **3.5.3** Manuel release and stow Verification.

Doors Operator

Section
1.1.0 thru **1.5.0** Door System Test Procedure

Section
2.0 thru **2.4.7** Door System Test procedure.